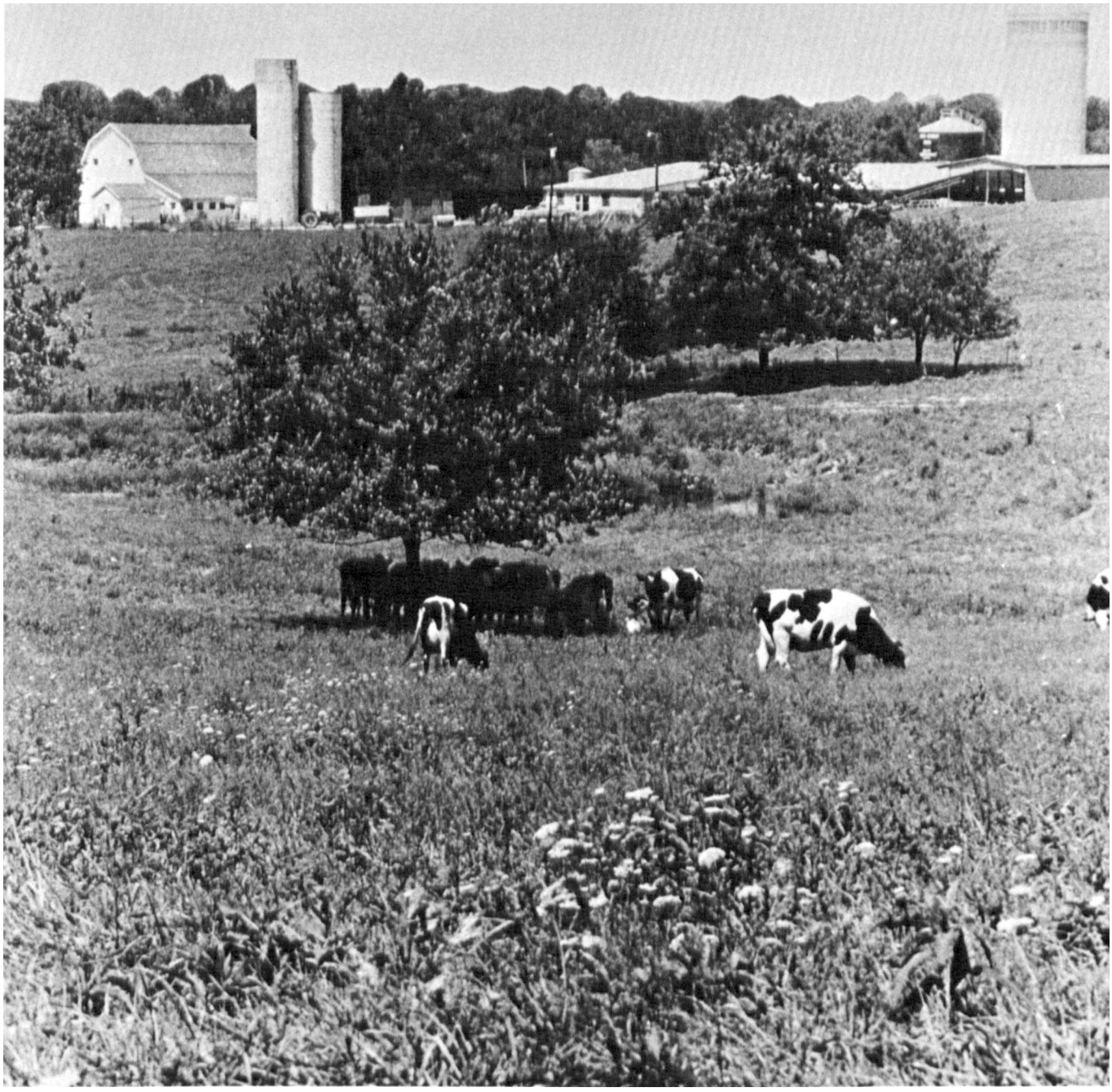
Soil Survey of

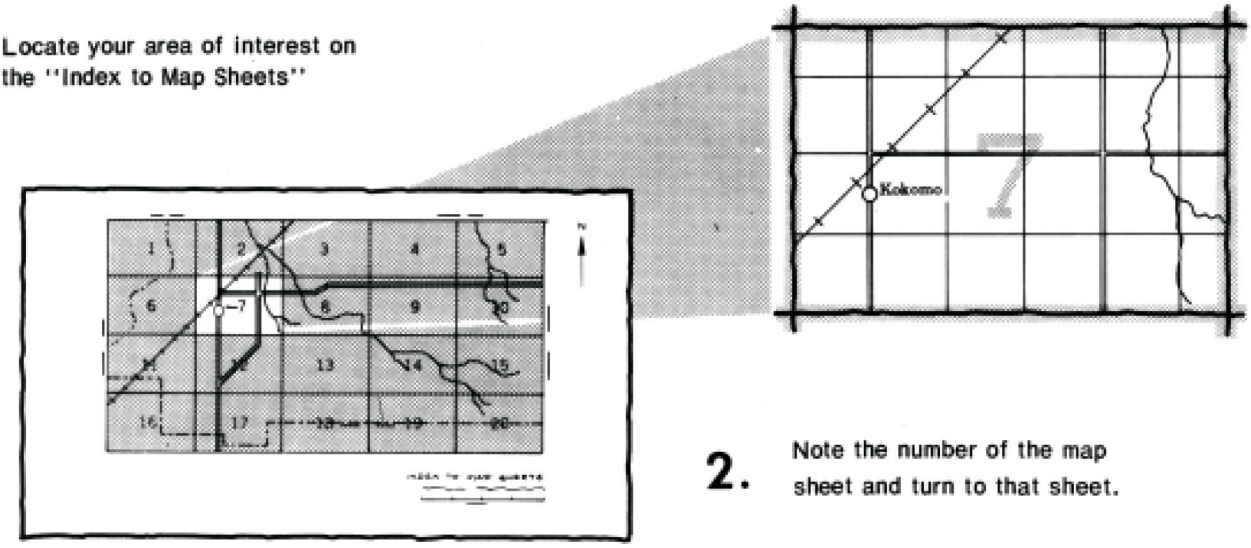
SHELBY COUNTY, KENTUCKY



United States Department of Agriculture
Soil Conservation Service
in cooperation with the
Kentucky Agricultural Experiment Station and the
Kentucky Department for Natural Resources and
Environmental Protection

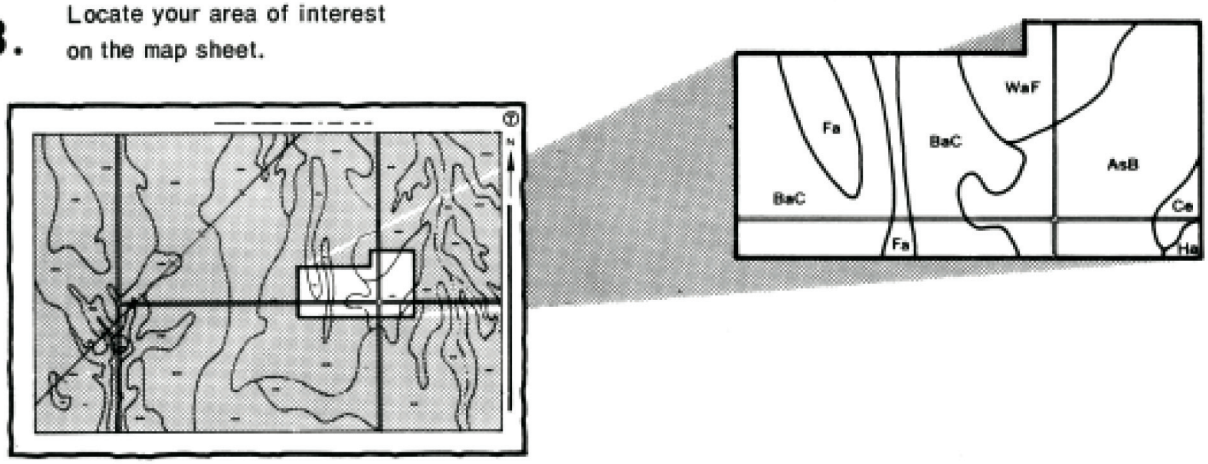
HOW TO USE

1. Locate your area of interest on the "Index to Map Sheets"

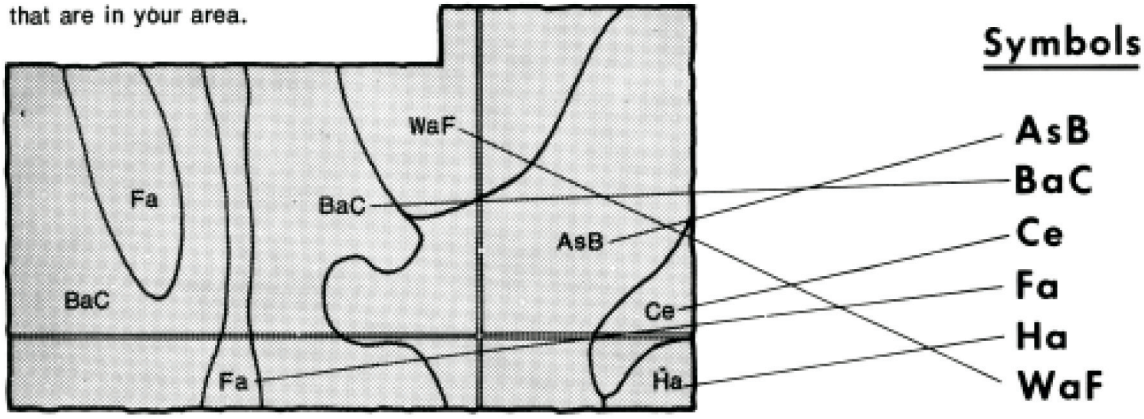


2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.

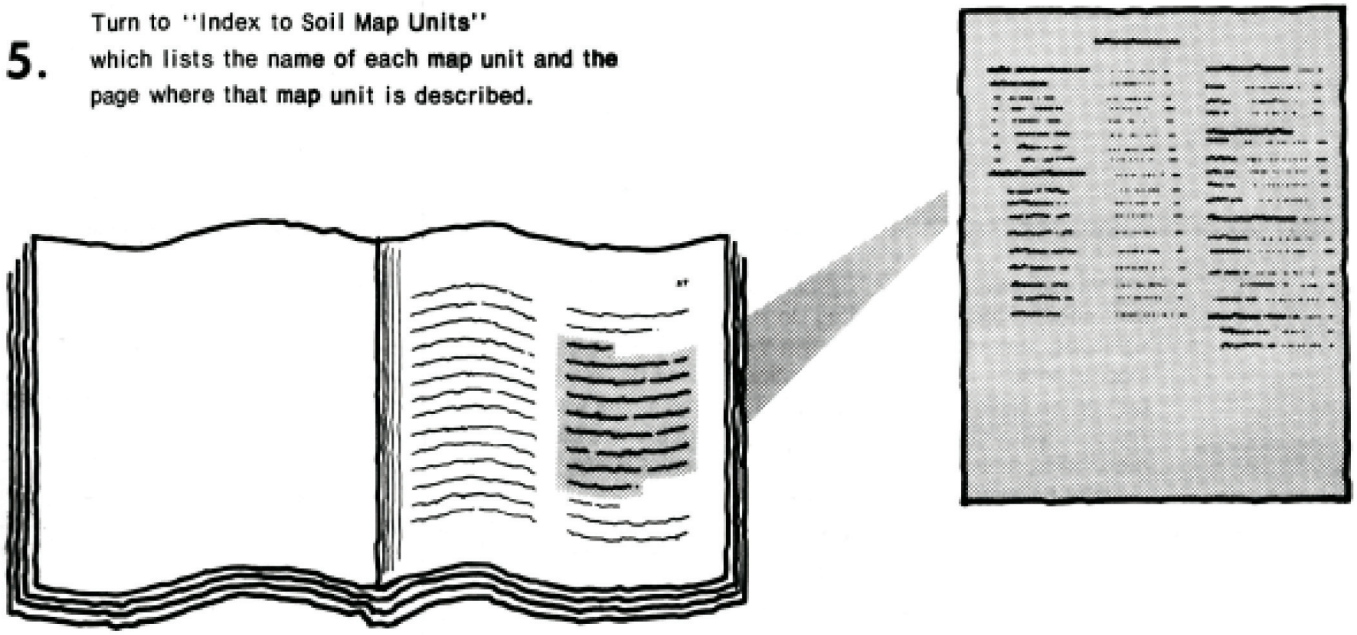


4. List the map unit symbols that are in your area.

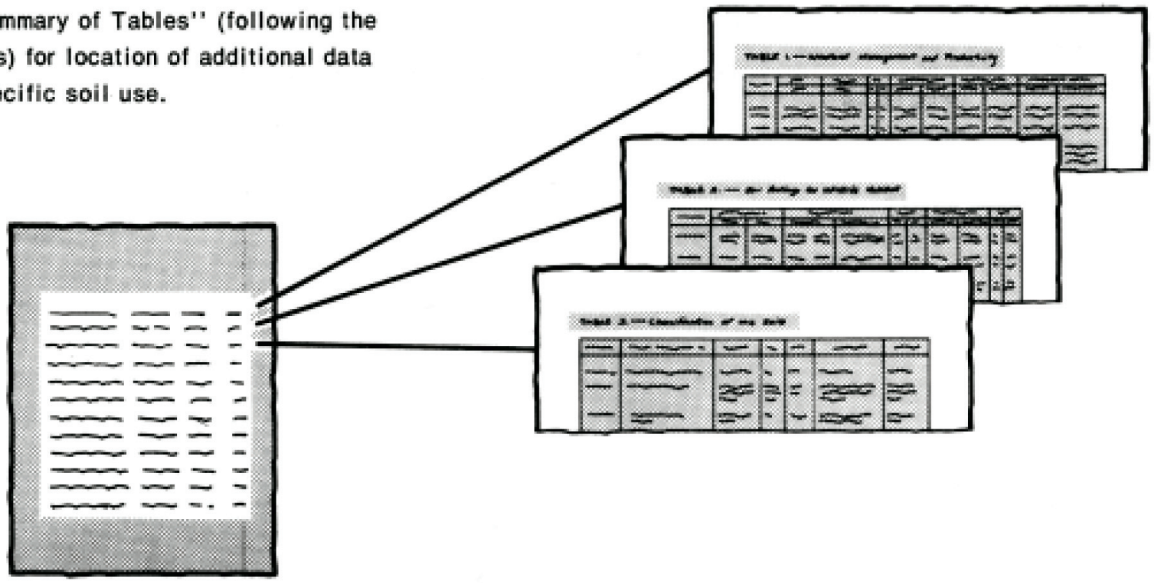


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was performed in the period 1975-77. Soil names and descriptions were approved in 1978. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1978. This survey was made cooperatively by the Soil Conservation Service, the Kentucky Department for Natural Resources and Environmental Protection, and the Kentucky Agricultural Experiment Station. It is part of the technical assistance furnished to the Shelby County Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Area of Faywood silt loam, 6 to 12 percent slopes, used for permanent pasture. The barns in the background are on Lowell silt loam, 2 to 6 percent slopes.

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Issued February 1980

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Foreword

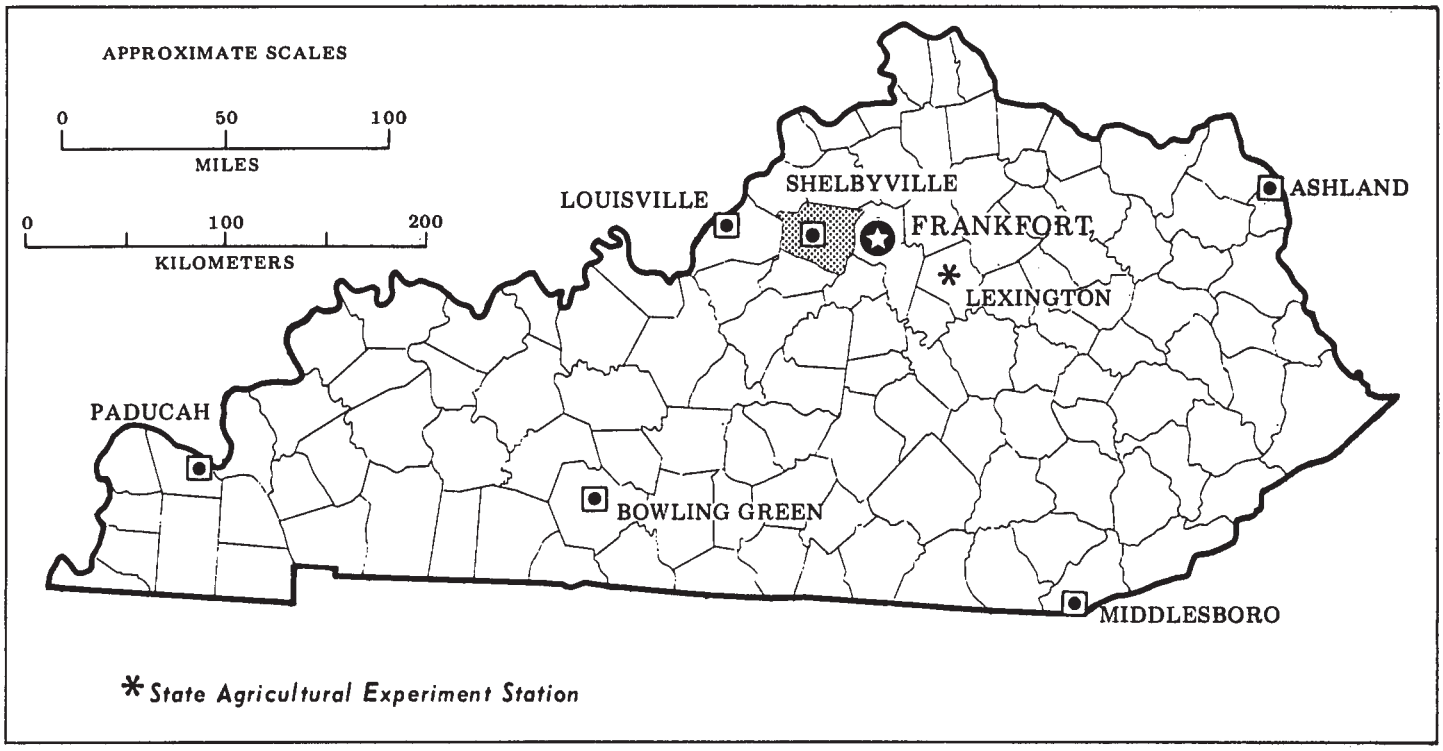
This soil survey contains information that can be used in land-planning programs in Shelby County, Kentucky. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Glen E. Murray
State Conservationist
Soil Conservation Service



Location of Shelby County in Kentucky.

Soil Survey of

SHELBY COUNTY, KENTUCKY

By Carl W. Hail, Orville J. Whitaker, Herman P. McDonald, and James P. Fehr,
Soil Conservation Service
and
Richard D. Rightmyer and Dennis Steve Gray,
Kentucky Department for Natural Resources and Environmental Protection

United States Department of Agriculture, Soil Conservation Service, in cooperation with the Kentucky Agricultural Experiment Station and the Kentucky Department for Natural Resources and Environmental Protection

SHELBY COUNTY is in the north-central part of Kentucky. It is bounded on the north by Henry County, on the east by Franklin and Anderson Counties, on the south by Spencer County, and on the west by Jefferson and Oldham Counties.

Shelby County has a land area of 245,120 acres, or 383 square miles. Shelbyville, the county seat, is the largest town in the county. Other incorporated towns are Simpsonville and Pleasureville.

In 1970 the population of Shelby County was about 19,000. Agriculture, trade and services, and manufacturing provide most of the employment in the county. Many county residents are employed by industry and government in Louisville and Frankfort.

Approximately half of Shelby County is in pasture; about 30 percent is used for row crops, small grains, and hay; about 18 percent is in woods; and the remainder is urban and nonfarm land. Tobacco, corn, soybeans, and small grains are the major harvested crops. Raising of dairy cattle (fig. 1), beef cattle, and hogs is the basis of the county's farm economy.

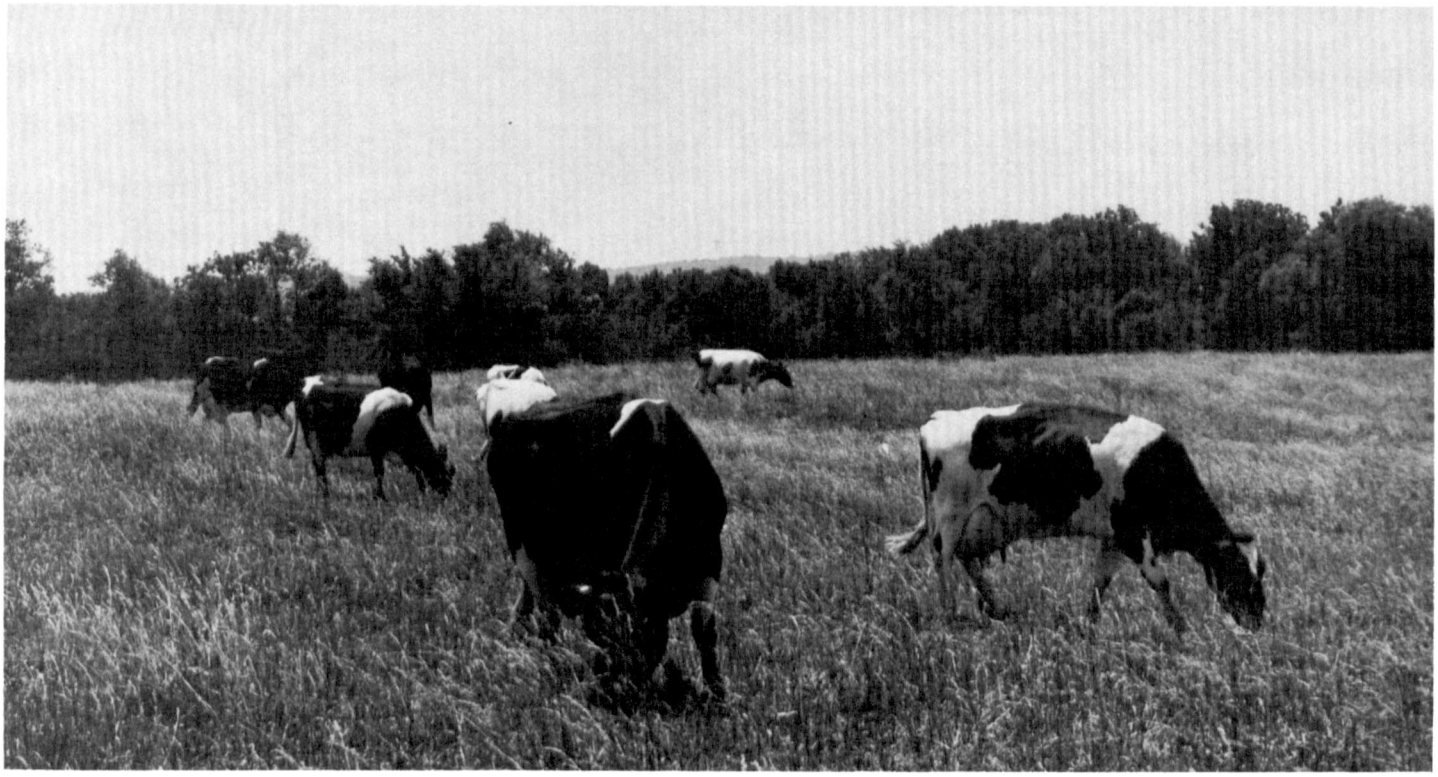


Figure 1.—Dairy cattle on pasture. The soil is Shelbyville silt loam, 2 to 6 percent slopes.

Shelby County is in two physiographic regions: the Outer Bluegrass and the Hills of the Bluegrass.

Shelby County is underlain by the Ordovician and Silurian geologic systems (*7*). The Ordovician is more extensive than the Silurian. The bedrock in the Ordovician System consists of interbedded limestone, shale, and siltstone. Lowell and Shelbyville soils formed in parent material derived from these rocks. The lower part of the Ordovician is dominated by shale, which formed a more completely dissected landscape. Eden soils developed on this landscape (fig. 2). The bedrock in the Silurian System consists of dolomite, shale, and limestone. The parent material of Beasley soils and part of the parent material of Crider soils were derived from these rocks. Solution caverns or sinks are quite common in both systems except in the lower part of the Ordovician. There is a thin loess mantle on the broader ridges.

Relief ranges from undulating to steep. About two-thirds of the county consists of undulating ridges and rolling side slopes. The broader ridges are in the central and north-central parts of the county. The steep areas are in the eastern part of the county and along the larger streams. Elevations range from about 1,180 feet on Jeptha Knob to about 600 feet in the southern and western parts of the county. The area is dissected by a dendritic stream pattern that drains mostly south. A small area in the northeastern part of the county drains north.

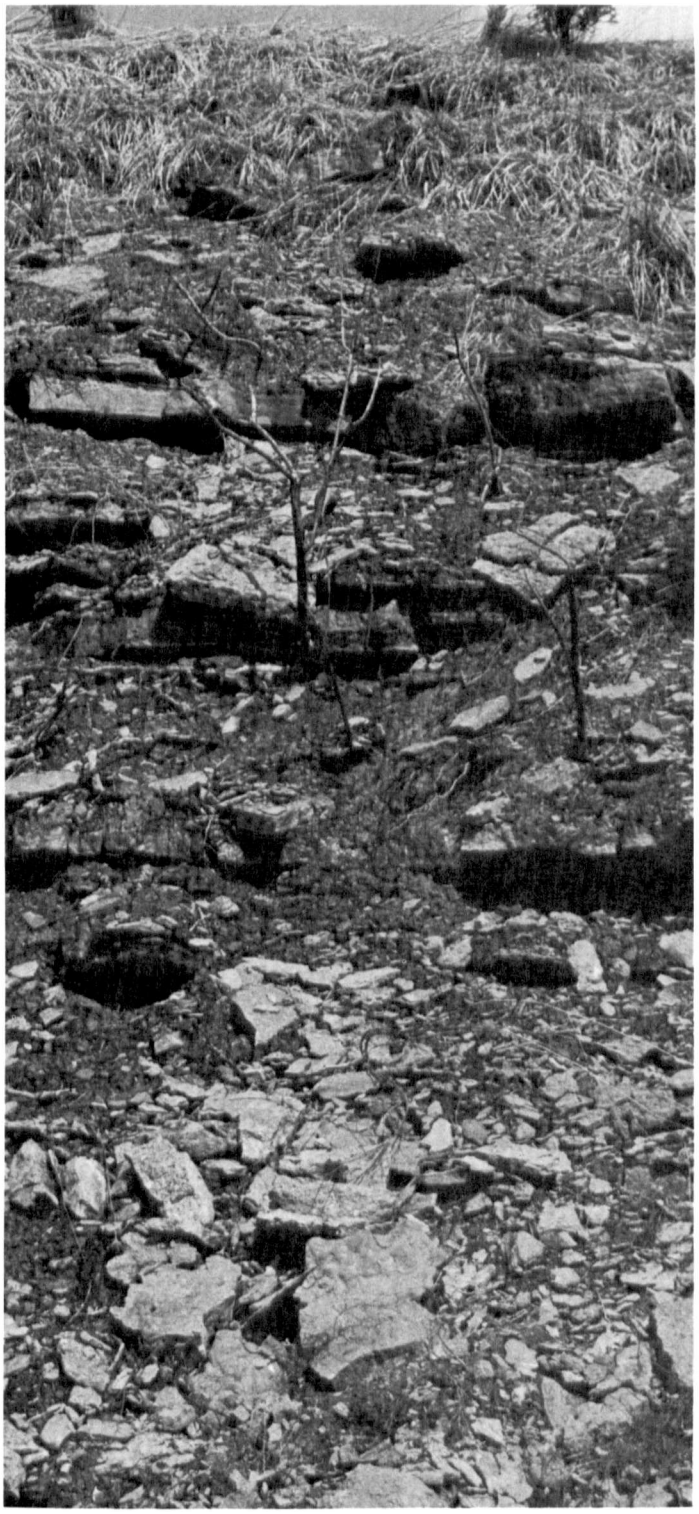


Figure 2.—Shale, limestone, and siltstone underlying Eden soils.

Climate

Prepared by the National Climatic Center, Asheville, North Carolina.

In Shelby County, summers are hot and winters are moderately cold. Rains are fairly heavy and well distributed throughout the year. Snow falls nearly every winter, but the snow cover usually lasts only a few days.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Shelbyville in the period 1951 to 1974. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 34 degrees F, and the average daily minimum temperature is 24 degrees. The lowest temperature on record, which occurred at Shelbyville on January 24, 1963, is -21 degrees. In summer the average temperature is 74 degrees, and the average daily maximum temperature is 85 degrees. The highest recorded temperature, which occurred on July 14, 1954, is 107 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50

degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 46 inches Of this, 23 inches, or 50 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 20 inches. The heaviest 1-day rainfall during the period of record was 4.32 inches at Shelbyville on May 8, 1961. Thunderstorms occur on about 45 days each year, and most occur in summer.

Average seasonal snowfall is 14 inches. The greatest snow depth at any one time during the period of record was 14 inches. On an average of 9 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 40 percent in winter. The prevailing wind is from the south Average windspeed is highest, 10 miles per hour, in winter.

How this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map for broad land use planning" and "Soil maps for detailed planning."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, woodland managers, engineers, planners, developers and builders, home buyers, and others.

General soil map for broad land use planning

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The soils in the survey area vary widely in their suitability for major land uses.

Descriptions of map units

1. Beasley-Crider-Nicholson

Deep, well drained and moderately well drained, gently sloping to moderately steep soils; on ridges and side slopes

This map unit occurs in the extreme western part of the county. The landscape consists of long, broad ridges and highly dissected side slopes (fig. 3).

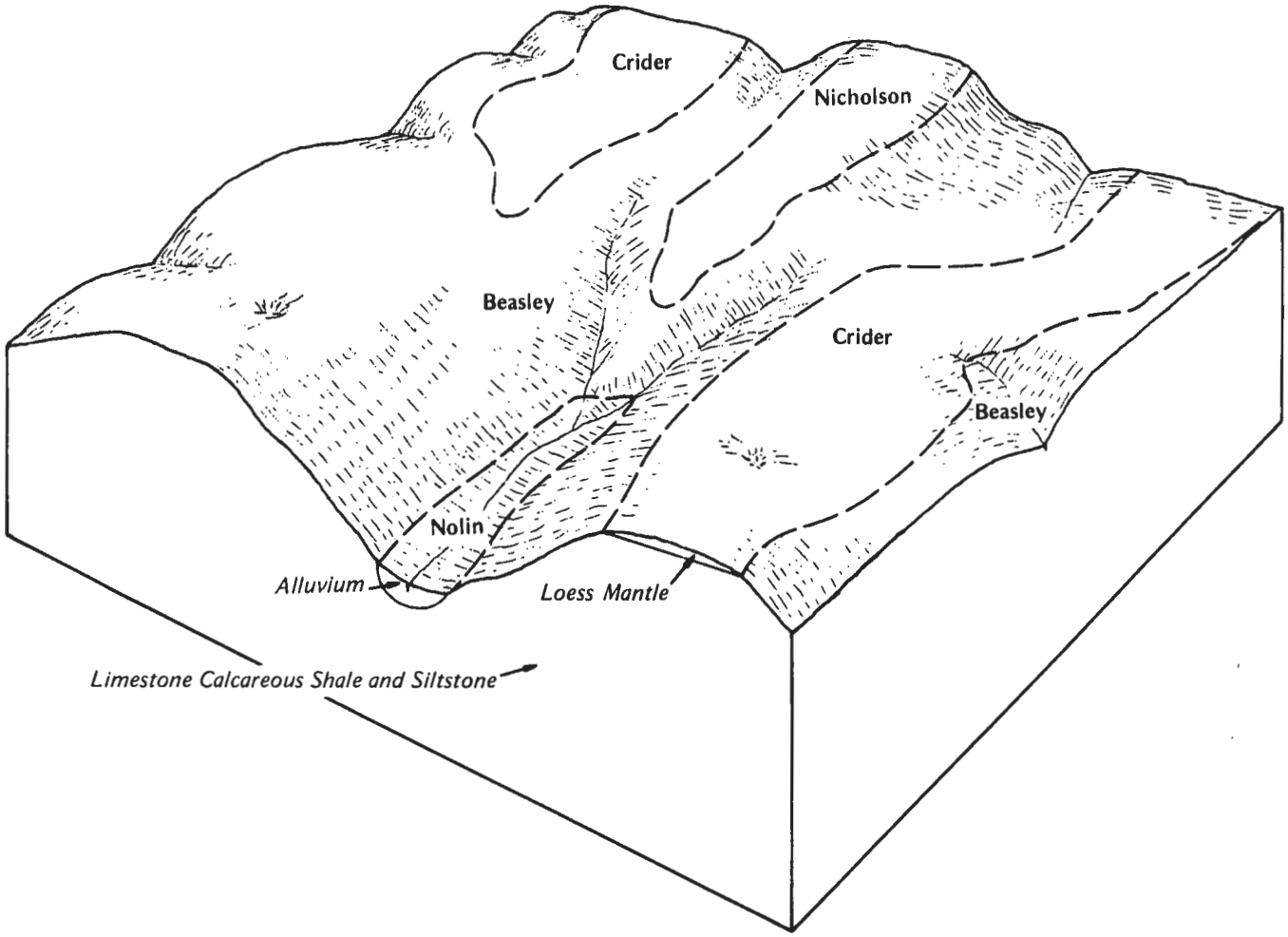


Figure 3.—Pattern of soils and underlying material in the Beasley-Crider-Nicholson unit.

This unit occupies about 2 percent of the county. It is about 48 percent Beasley soils, 18 percent Crider soils, 11 percent Nicholson soils, and 23 percent soils of minor extent.

Beasley soils formed in the residuum of calcareous shale, siltstone, and limestone. They have a silty clay and clay subsoil. These deep soils are gently sloping to sloping on narrow convex ridges and sloping to moderately steep on side slopes. Some areas have karst topography.

Crider soils formed partly in loess and partly in the residuum of dolomitic limestone. The subsoil is silt loam and silty clay loam to about 3 feet and silty clay or clay below. These deep, gently sloping soils occupy the higher ridges above Beasley soils.

Nicholson soils formed partly in loess and partly in the residuum of limestone, calcareous shale, and siltstone. They have a silt loam and silty clay loam subsoil over a fragipan at about 2 feet. These deep, mostly gently sloping soils are on ridges.

The minor soils in this unit are Faywood, Lowell, and Brassfield soils on uplands and Nolin, Elk, and Woolper soils in valleys.

Most of this unit is cleared for pasture, hay, corn, tobacco, and soybeans. Some areas are being developed for housing, and some of the steeper soils are in woods or brush.

This unit is suitable for farming. The ridges are suited to cultivated crops, and sloping areas are better suited to pasture and hay. The unit is also suitable for woodland and for wildlife habitat. Most areas are suited to urban uses. Slow and moderately slow permeability, clayey textures, shrink-swell potential, and slope are the main limi-

tations. The well drained soils on ridges are well suited to most urban uses.

2. Lowell-Nicholson

Deep, well drained and moderately well drained, gently sloping to sloping soils; on ridges and short side slopes

The landscape of this map unit consists of long, winding, narrow to fairly broad ridgetops and short side slopes throughout the county (fig. 4).

This unit occupies about 46 percent of Shelby County. It is about 58 percent Lowell soils, 16 percent Nicholson soils, and 26 percent soils of minor extent.

Lowell soils formed in the residuum of interbedded limestone, calcareous shale, and siltstone. They have a silty clay and clay subsoil. These deep, gently sloping to sloping soils are on convex ridges and concave side slopes. Some areas have karst topography.

Nicholson soils formed partly in loess and partly in the residuum of limestone, calcareous shale, and siltstone. The subsoil is silt loam or silty clay loam over a fragipan at about 2 feet. These deep, gently sloping to sloping soils are on convex ridges and upper side slopes.

The minor soils in this unit are Shelbyville and Faywood soils on uplands and Nolin, Otwell, Elk, and Newark soils in valleys.

Most of this unit is cleared for pasture, hay, corn, and tobacco. Some small areas are in woods or brush.

This unit is suitable for farming. The ridges are suited to cultivated crops, and sloping areas are better suited to pasture and hay. This unit is also suited for urban uses. Slow permeability, clayey textures, shrink-swell potential, wetness, and slope are limitations for residential and

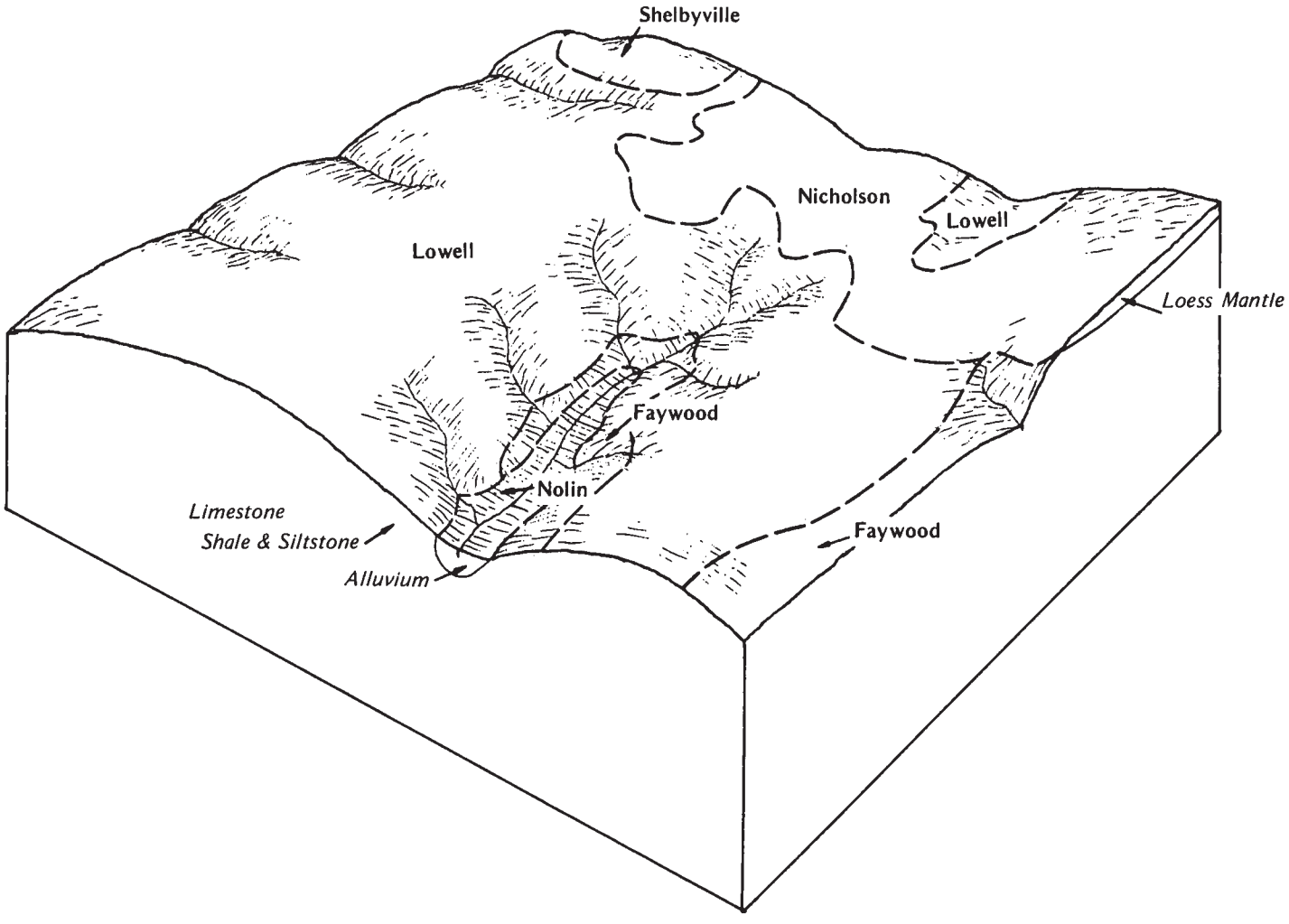


Figure 4.—Pattern of soils and underlying material in the Lowell-Nicholson unit.

other urban uses. This unit is also well suited to woodland and to wildlife habitat.

3. Shelbyville-Lowell

Deep, well drained, gently sloping to sloping soils; on broad ridges and short side slopes

This map unit occupies the smoother areas of the central and north-central parts of the county. The landscape consists of broad ridges and short side slopes (fig. 5).

This unit occupies about 24 percent of the county. It is about 40 percent Shelbyville soils, 36 percent Lowell soils, and 24 percent soils of minor extent.

Shelbyville soils formed partly in loess and partly in the residuum of limestone, shale, and siltstone. They have a silty clay loam subsoil underlain by silty clay. These deep, well drained, mostly gently sloping soils are on slightly convex ridges. Some areas have karst topography.

Lowell soils formed in the residuum of interbedded limestone, calcareous shale, and siltstone. They have a silty clay or clay subsoil. These deep, gently sloping to sloping soils are on convex ridges and concave side slopes. Some areas have karst topography.

The minor soils in this unit are Nicholson and Faywood soils on uplands and Nolin and Elk soils in valleys (fig. 6).

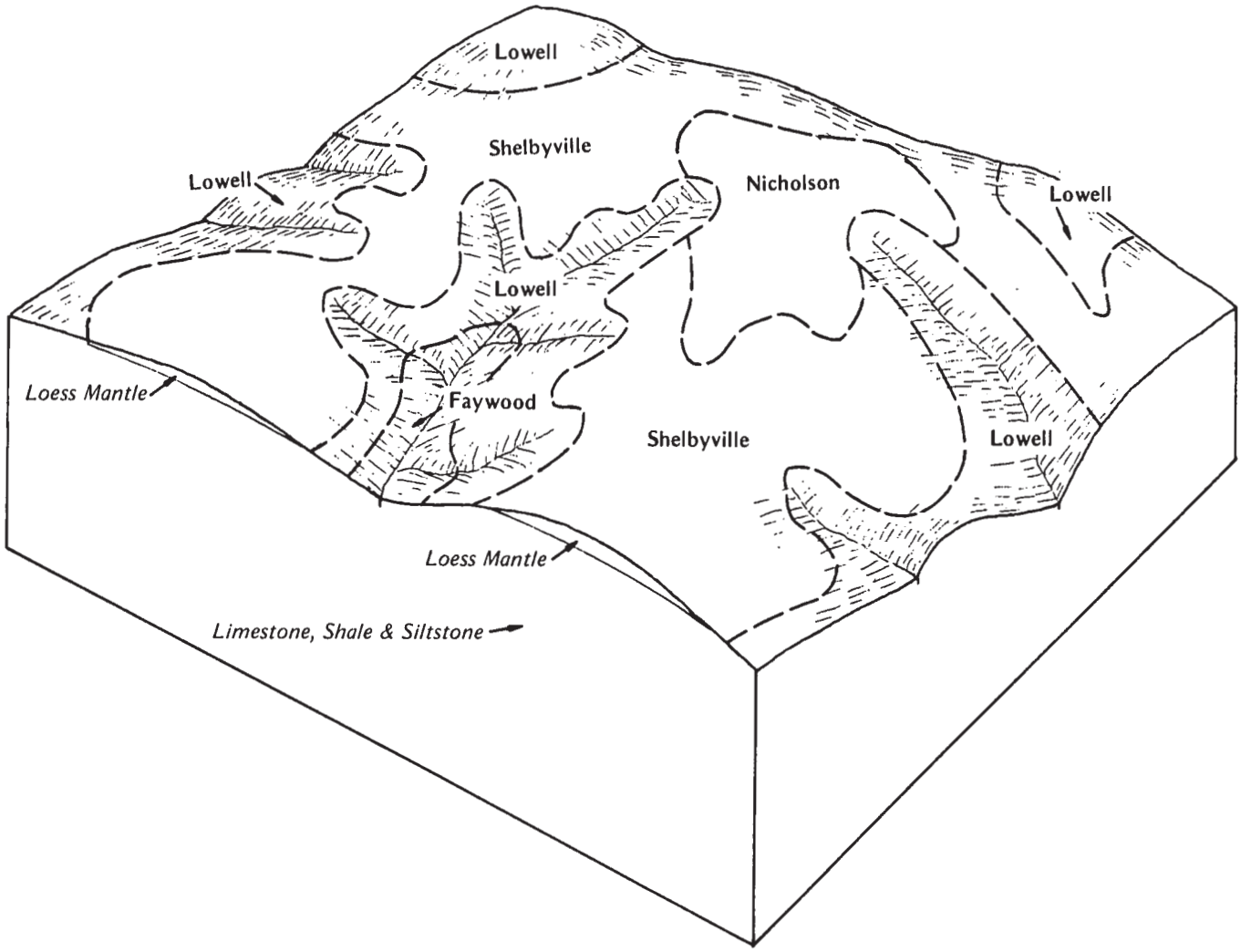


Figure 5.—Pattern of soils and underlying material in the Shelbyville-Lowell unit.

Figure 6.—Burley tobacco on Nolin silt loam in the foreground and soybeans on Elk silt loam, 0 to 2 percent slopes, in the background.

Most of this unit is cleared for corn, tobacco, soybeans, pasture, and hay. A few areas are in woods or brush.

This unit is well suited for farming. The gently sloping soils are well suited to crops commonly grown in the county, and sloping soils are better suited to hay and pasture. Most of this unit is suited to urban uses. Slow permeability, clayey textures, shrink-swell potential, and slope are limitations for residential and other urban uses. This unit is well suited to woodland and to wildlife habitat.

4. Lowell-Eden

Deep and moderately deep, well drained, steep soils; on hillsides

This map unit occurs only in the vicinity of Jeptha Knob, an uplifted area with many faults and folds. The elevation of Jeptha Knob is 200 to 300 feet higher than that of the surrounding uplands. The landscape consists of steep hillsides and convex ridgetops with slopes ranging from 20 to 40 percent (fig. 7).

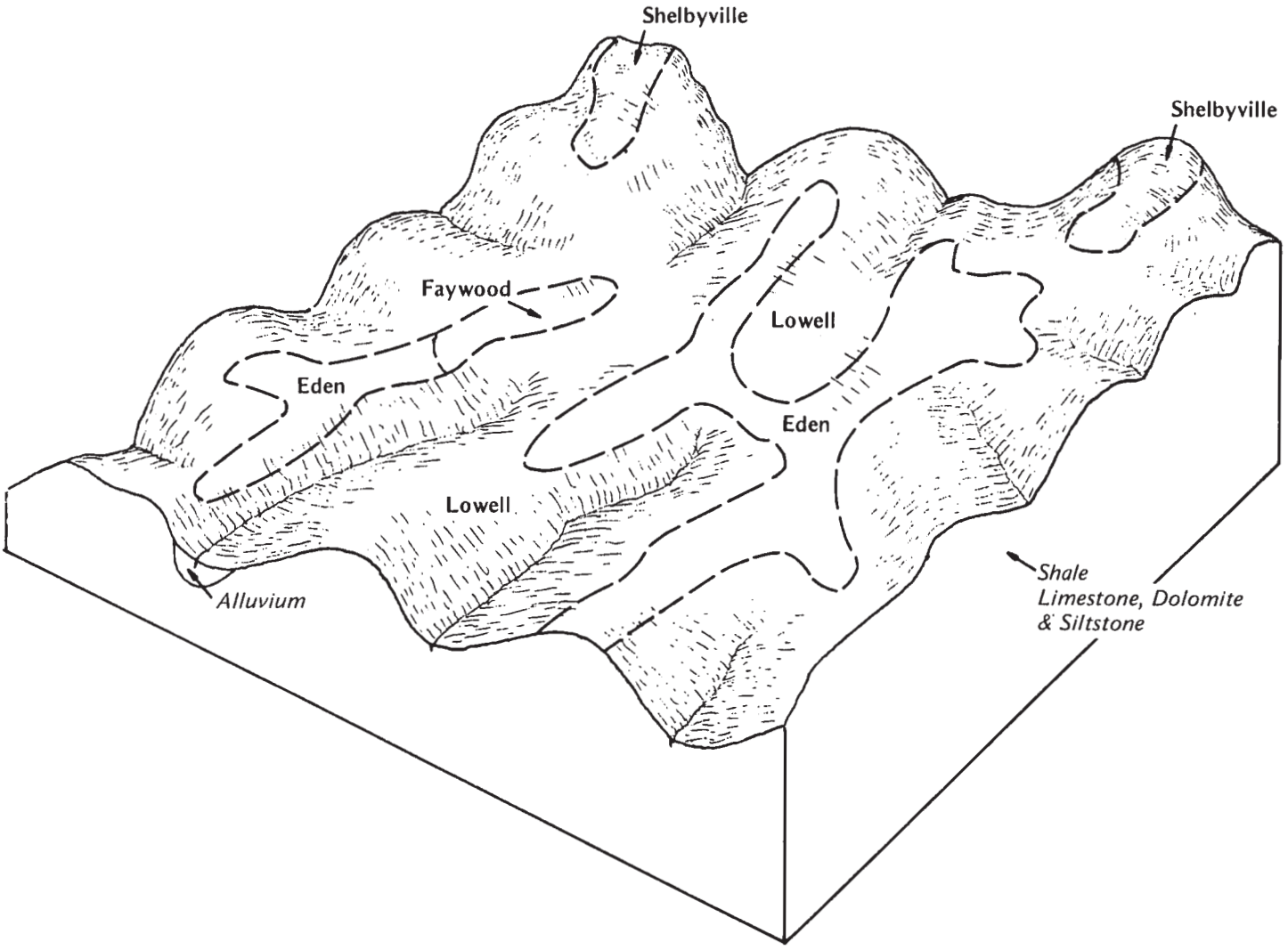


Figure 7.—Pattern of soils and underlying material in the Lowell-Eden unit.

This unit occupies less than 1 percent of the county. It is about 40 percent Lowell soils, 25 percent Eden soils, and 35 percent soils of minor extent.

Lowell soils formed in the residuum of interbedded limestone, calcareous shale, and siltstone. They have a cherty silty clay subsoil. These deep, well drained soils are on upper slopes, side slopes, and convex hilltops.

Eden soils formed in the residuum of interbedded calcareous shale, siltstone, and limestone. They have a silty clay subsoil. These moderately deep soils are on convex ridges and upper side slopes.

The minor soils in this unit are Shelbyville and Faywood soils on ridgetops. There are also small areas of rock outcrops and large boulders. Coarse fragments of chert or flat fragments of limestone are on the surface in most areas.

Most of this unit is in woods, but some of the smoother slopes are in pasture.

This unit is poorly suited for farming and urban uses because of the steep slopes. It is suitable for growing trees and providing habitat for woodland wildlife.

5. Eden-Lowell

Moderately deep and deep, well drained, gently sloping to steep soils; on hillsides and narrow ridges

This map unit is a hilly, highly dissected area of hillsides, narrow winding ridges, and V-shaped valleys (fig. 8). It occurs in the eastern and southeastern parts of the county. Slope ranges from 6 to 30 percent.

This unit occupies about 28 percent of the county. It is about 69 percent Eden soils, 16 percent Lowell soils, and 15 percent soils of minor extent.

Eden soils formed in the residuum of interbedded calcareous shale, siltstone, and limestone. They have a silty clay subsoil. These moderately deep, well drained, slop-

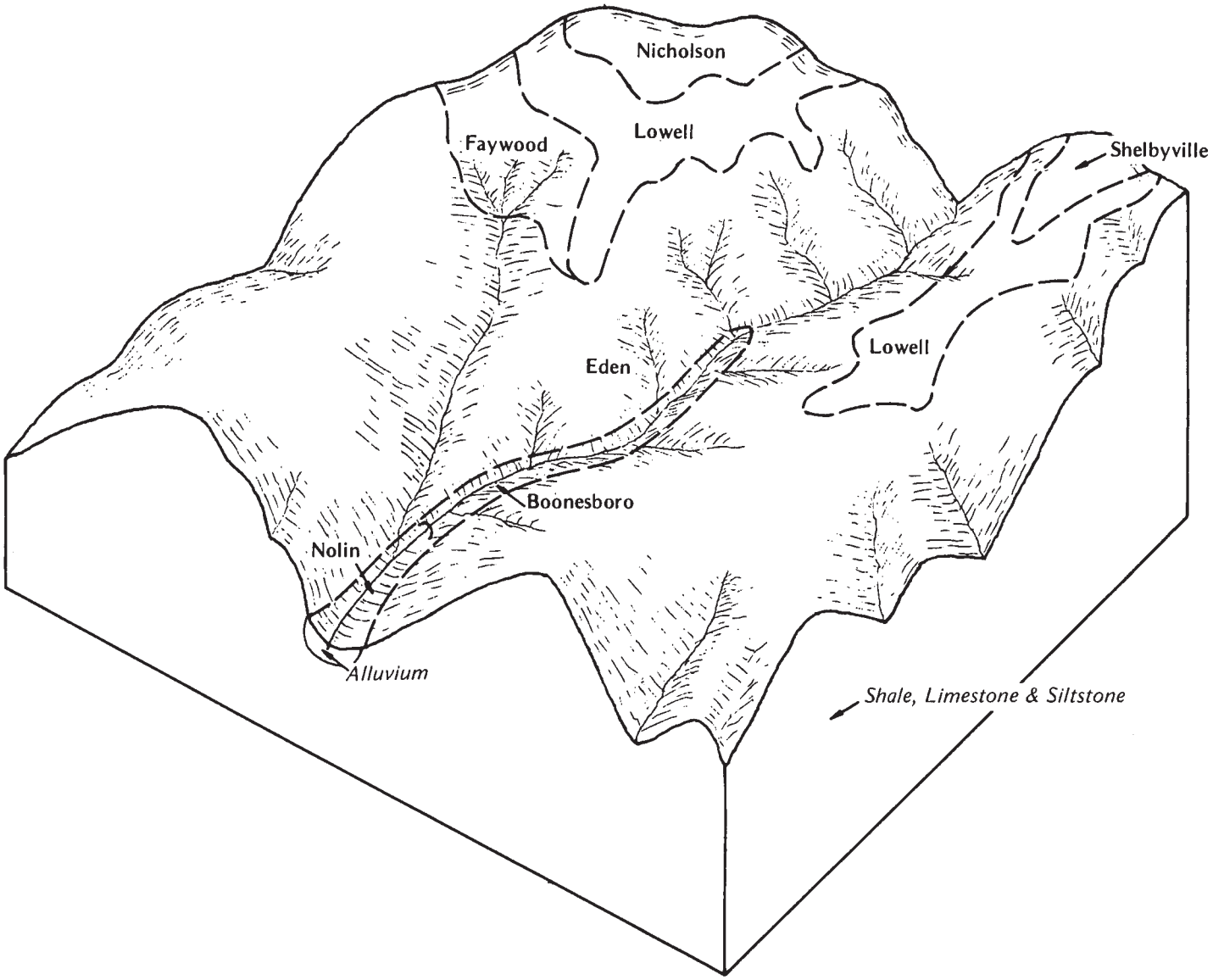


Figure 8.—Pattern of soils and underlying material in the Eden-Lowell unit.

ing to steep soils are on side slopes and convex ridges.

Lowell soils formed in the residuum of interbedded limestone, calcareous shale, and siltstone. They have a silty clay or clay subsoil. These deep, gently sloping to sloping soils are on ridgetops and upper side slopes.

The minor soils in this unit are Faywood and Fairmount soils on upper side slopes, Nicholson and Shelbyville soils on ridgetops, and Nolin and Boonesboro soils near small streams.

Most of this unit is in woods or brush, but some areas are pasture. In some areas row crops and hay are grown on the wider ridges.

This unit is poorly suited to farming and most urban uses because of the steep slopes. Some of the smoother areas are suited to pasture and hay but stands of suitable grasses and legumes are difficult to establish and maintain. This unit is suited to woodland and to wildlife habitat.

Broad land use considerations

The general soil map broadly shows the landscape and soil features of Shelby County for use in general planning. It is not a substitute for detailed maps, which are needed in planning the use of a specific site.

The soils that are well suited for cultivated crops usually are also well suited for other uses. The Shelbyville-Lowell unit consists of Shelbyville soils on broad ridges and Lowell soils on side slopes; this unit is well suited for all cultivated crops. The Lowell-Nicholson unit con-

sists of Lowell soils on narrow ridges and broader areas of Nicholson soils; this unit is more sloping than the Shelbyville-Lowell unit and is suited for cultivated crops. The Beasley-Crider-Nicholson unit is similar in topography to the Lowell-Nicholson unit, but more of the Beasley soils are severely eroded. The smoother areas of the Beasley-Crider-Nicholson unit are suited for cultivated crops. The Lowell-Eden and Eden-Lowell units are poorly suited for cultivated crops because of steep slopes.

The Beasley-Crider-Nicholson, Lowell-Nicholson, and Shelbyville-Lowell units all are suited for urban development but are limited by the clayey subsoil, shrink-swell potential, wetness, and slope. The Shelbyville-Lowell unit has fewer limitations because the topography is less sloping and the soils on ridges are deeper to clay. The Lowell-Eden and Eden-Lowell units are poorly suited for urban development because of steep slopes and the clayey texture of the soils.

A small acreage of specialty crops, including vegetables, orchard crops, and nursery plants, is grown in the county. Soils suited to specialty crops are scattered throughout the survey area, but they are very limited in the Lowell-Eden and Eden-Lowell units. Deep soils that have good natural drainage and that warm up early in spring are preferred for vegetables and orchards; such soils are more extensive in the Shelbyville-Lowell unit.

Most map units in the county are suited or well suited for woodland production. Although the soils in the Shelbyville-Lowell unit are well suited for timber production, most are also well suited for other crops of greater economic value. Most woodland production in the county is on the Lowell-Eden and Eden-Lowell units. These units are suited for woodland, but commercially valuable trees are not common and steep slopes limit equipment use.

Most map units in Shelby County are not well suited for intensive recreation areas. The Shelbyville-Lowell unit is the exception; it is well suited for intensive recreation use but also is well suited for other uses. The Beasley-Crider-Nicholson unit and Lowell-Nicholson unit are limited for intensive recreation use because of the slow permeability of the subsoil. The Eden-Lowell unit and Lowell-Eden units are poorly suited for small recreation areas due to the steep slopes. All of the units are well suited for large recreation areas; limitations such as slope, permeability, or wetness affect only small areas.

Soil maps for detailed planning

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil, a brief description of the soil profile, and a listing of the principal hazards and limitations to be considered in planning management.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Lowell silt loam, 6 to 12 percent slopes, is one of several phases in the Lowell series.

Some map units are made up of two or more major soils. These map units are called soil complexes or soil associations.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Woolper-Fairmount complex, 30 to 65 percent slopes, is an example.

A *soil association* is made up of two or more geographically associated soils that are shown as one unit on the maps. Because of present or anticipated soil uses in the survey area, it was not considered practical or necessary to map the soils separately. The pattern and relative proportion of the soils are somewhat similar. Lowell-Eden association, steep, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Soil descriptions

BeB—Beasley silt loam, 2 to 6 percent slopes. This deep, well drained soil is mostly on narrow ridges. Slopes are convex and range from 150 to 500 feet in

length. Some of the larger areas of this soil have karst topography. Areas range from 5 to 50 acres or more.

Typically, the surface layer is brown silt loam about 5 inches thick. The subsoil extends to a depth of 39 inches. It is strong brown silty clay and clay in the upper 18 inches and mottled brown, pale yellow, and pale olive clay in the lower 16 inches. The substratum, about 4 inches thick, is mottled dark yellowish brown, light brownish gray, and yellowish brown silty clay. Soft interbedded calcareous shale, siltstone, and limestone are at a depth of 43 inches.

Available water capacity is high, and permeability is moderately slow. Runoff is medium. Natural fertility is medium, and organic matter content is moderate. Reaction ranges from very strongly acid to neutral in the upper part of the soil and from neutral to moderately alkaline in the lower part. The lower part of the soil is calcareous. This soil is easy to till. The subsoil is plastic and sticky and has moderate shrink-swell potential. The root zone is moderately deep.

Included with this soil in mapping are small areas of Crider and Nicholson soils. Also included are small areas of a soil that has a yellowish red subsoil and a few small areas of severely eroded Beasley soils.

Most of this Beasley soil is cleared for cultivated crops, hay, and pasture. It is well suited to the row crops and small grains commonly grown in the area. Adapted crops include corn and tobacco. Crops respond well to fertilizer and lime. The erosion hazard is moderate, and some measures for controlling erosion are needed if cultivated crops are grown. Contour tillage, stripcropping, minimum tillage, return of crop residue to the soil, use of cover crops, and inclusion of grasses and legumes in the cropping system help to control erosion and maintain organic matter content.

This soil is well suited to the pasture and hay plants commonly grown in the area. If properly managed, it produces high yields. Plants selected for pasture and hay should produce adequate forage and provide satisfactory ground cover. The desired species should be maintained through frequent renovation of pasture. Application of lime and fertilizer, maintenance of proper stocking rates, rotational grazing, and control of undersirable vegetation are needed.

This soil is suited to shortleaf pine, loblolly pine, white ash, eastern redcedar, and eastern white pine. Equipment limitation and plant competition are management concerns.

This soil is suited to most urban uses. Moderately slow permeability is a limitation for septic tanks, the clayey texture is a limitation for sanitary landfills and shallow excavations, and low strength is a limitation for local roads and streets.

Capability subclass IIe and woodland group 3c.

BeC—Beasley silt loam, 6 to 12 percent slopes. This deep, well drained, sloping soil is on convex ridgetops and concave side slopes. Slopes range from 150 to 800 feet in length. Some areas of this soil have karst topography. This soil occurs on long, narrow ridges and long, winding areas dissected by many small drainageways. Areas range from 5 to 80 acres or more.

Typically, the surface layer is brown silt loam about 5 inches thick. The subsoil extends to a depth of 39 inches. It is strong brown silty clay and clay in the upper 18 inches and mottled brown, pale yellow, and pale olive clay in the lower 16 inches. The substratum is mottled dark yellowish brown, light brownish gray, and yellowish brown silty clay. Soft interbedded calcareous shale, siltstone, and limestone are at a depth of 43 inches.

Available water capacity is high, and permeability is moderately slow. Runoff is rapid. Natural fertility is medium, and organic matter content is low. Reaction ranges from very strongly acid to neutral in the upper part of the soil and from neutral to moderately alkaline in the lower part. The lower part of the soil is calcareous. This soil is somewhat difficult to till. The subsoil is sticky and plastic and has moderate shrink-swell potential. The root zone is moderately deep.

Included with this soil in mapping are small areas of Brassfield, Lowell, and Faywood soils. Also included are small areas of soils that are less than 40 inches deep to bedrock, small areas of severely eroded soils, and a few areas that have a few deep gullies.

Most of the acreage of this Beasley soil is in hay and pasture, and some areas are in woods or are idle. Although this soil is suited to occasional cultivation, it is better suited to pasture and hay. Response of crops to fertilizer and lime is fair. This soil is somewhat difficult to till because the surface layer consists partly of subsoil material. The hazard of erosion is severe; some measures for controlling erosion are needed if cultivated crops are grown. Contour tillage, stripcropping, minimum tillage, return of crop residue to the soil, use of cover crops, and inclusion of grasses and legumes in the cropping system help to control erosion and maintain organic matter content.

This soil is well suited to pasture and hay. If properly managed, it produces moderate yields. Plants selected for pasture and hay should provide satisfactory ground cover to prevent further erosion. The desired species should be maintained through frequent renovation of pasture. Application of lime and fertilizer, maintenance of proper stocking rates, use of rotational grazing, and control of undesirable vegetation are needed.

Although most areas are cleared, this soil is suited to shortleaf pine, loblolly pine, white ash, eastern redcedar, and eastern white pine. Equipment limitation and plant competition are management concerns.

This soil is suited to urban uses. Moderately slow permeability, clayey texture, and steepness of slope are limitations for sanitary facilities (fig. 9). The clayey texture is a limitation for shallow excavations, and low strength is a limitation for local roads and streets.

This soil is in capability subclass IIIe and woodland group 3c.

Figure 9.—Urban development and erosion on Beasley silt loam, 6 to 12 percent slopes.

BeD—Beasley silt loam, 12 to 20 percent slopes. This deep, well drained soil is on side slopes. Slopes range from 150 to 500 feet in length. This soil occurs in long winding areas dissected by many small drainageways. Areas range from 5 to 30 acres or more.

Typically, the surface layer is brown silt loam about 5 inches thick. The subsoil extends to a depth of 39 inches. It is strong brown silty clay and clay in the upper 18 inches and mottled brown, pale brown, and pale olive clay in the lower 16 inches. The substratum is mottled dark yellowish brown, light brownish gray, and yellowish brown silty clay. Soft interbedded calcareous shale, siltstone, and limestone are at a depth of 43 inches.

Available water capacity is high, and permeability is moderately slow. Runoff is rapid. Natural fertility is medium, and organic matter content is low. Reaction ranges from very strongly acid to neutral in the upper part of the soil and from neutral to strongly alkaline in the lower part. The lower part of the soil is calcareous. This soil is somewhat difficult to till. The subsoil is sticky and plastic and has moderate shrink-swell potential. The root zone is moderately deep.

Included with this soil in mapping are small areas of Brassfield, Lowell, and Faywood soils. Also included are small areas of soils that are less than 40 inches deep to bedrock. These small areas include severely eroded Beasley soils and a few areas that have a few deep gullies.

Most of the acreage of this Beasley soil is in pasture or hay, and some areas are in woods or brush. Although this soil is suited to occasional cultivation, it is better suited to pasture and hay. Response of crops to fertilizer and lime is fair. This soil is somewhat difficult to till because in most places the surface layer contains subsoil material. The hazard of erosion is very severe; some measures for controlling erosion are needed if cultivated crops are grown. Contour tillage, stripcropping, minimum tillage, return of crop residue to the soil, use of cover crops, and inclusion of grasses and legumes in the cropping system help to control erosion and maintain organic matter content.

This soil is suited to pasture and hay. If properly managed, it produces moderate yields. Plants selected for pasture and hay should provide satisfactory ground cover to prevent further erosion. The desired species should be maintained through frequent renovation of pasture. Application of lime and fertilizer, maintenance of proper stocking rates, use of rotational grazing, and control of undesirable vegetation are needed.

Although most areas are cleared, this soil is suited to shortleaf pine, loblolly pine, white ash, eastern redcedar, and eastern white pine. Equipment limitation, erosion hazard, and plant competition are management concerns.

This soil is poorly suited to most urban uses because of steepness of slope, moderately slow permeability, and clayey texture.

This soil is in capability subclass IVe and woodland group 3c.

BfC3—Beasley silty clay loam, 6 to 12 percent slopes, severely eroded. This deep, well drained, sloping soil is on convex ridgetops and concave side slopes. Slopes range from 150 to 600 feet in length. Some areas of this soil have karst topography. This soil occurs in oblong or long and narrow areas dissected by many small drainageways. Areas range from 5 to 30 acres or more in size. In most places this soil has lost most of its original surface layer. In some places, there are a few deep gullies and small areas where most of the subsoil has been eroded.

Typically, the surface layer is yellowish brown silty clay loam about 5 inches thick. The subsoil, extending to a

depth of 20 inches, is yellowish brown clay. The substratum to a depth of 47 inches is yellowish brown and light brownish gray clay that contains few shale fragments and carbonate nodules.

Available water capacity is high, and permeability is moderately slow. Runoff is rapid. Natural fertility is medium, and organic matter content is low. Reaction ranges from very strongly acid to neutral in the surface layer and subsoil and from neutral to strongly alkaline in the substratum. The substratum is calcareous. The root zone is moderately deep. This soil is difficult to till because of the high clay content in the plow layer. The soil has clayey texture, low strength, and moderate shrink-swell potential.

Included with this soil in mapping are small areas of Brassfield, Lowell, and Faywood soils. Also included are small areas of soils less than 40 inches deep to hard bedrock.

Most of the acreage of this Beasley soil is in hay, pasture, woods, or brush. This soil is poorly suited to cultivated crops. Although it is suited to occasional cultivation, it is better suited to hay and pasture or to woodland or wildlife habitat. Response of crops to fertilizer and lime is fair. This soil is difficult to till because the surface layer consists mostly of subsoil material. The hazard of erosion is very severe; measures that control erosion and reduce runoff are needed if cultivated crops are grown. Contour tillage, stripcropping, minimum tillage, return of crop residue to the soil, use of cover crops, and inclusion of grasses and legumes in the cropping system help to control erosion and maintain organic matter content.

If properly managed, this soil is suited to pasture and hay. Plants selected for pasture and hay should produce adequate forage and provide satisfactory ground cover to prevent further erosion. The desired species should be maintained through frequent renovation of pasture. Application of lime and fertilizer, maintenance of proper stocking rates, use of rotational grazing, and control of undesirable vegetation are needed.

This soil is suited to shortleaf pine, Virginia pine, and eastern redcedar. Equipment limitation, seedling mortality, and erosion hazard are management concerns.

This soil is suited to urban uses. Moderately slow permeability, steepness of slope, and clayey texture are limitations for sanitary facilities; the clayey texture is a limitation for shallow excavations and for buildings; and low strength is a limitation for local roads and streets.

This soil is in capability subclass IVe and woodland group 4c.

Bo—Boonesboro silt loam. This moderately deep, well drained, nearly level soil is on flood plains in narrow valleys. Slope ranges from 0 to 2 percent. Areas are long and narrow and range from 5 to 20 acres.

Typically, the surface layer is dark brown silt loam about 10 inches thick. The subsoil, extending to a depth of 20 inches, is brown silt loam. The substratum is brown silt loam that extends to a depth of 30 inches. Below is hard limestone bedrock.

Available water capacity and permeability are moderate. Runoff is medium. Natural fertility is medium, and organic matter content is moderate. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. Reaction ranges from slightly acid to mildly alkaline. The root zone extends to bedrock at a depth of 20 to 40 inches. This soil is subject to frequent flooding.

Included with this soil in mapping are small areas of Nolin and Newark soils. Small areas of a moderately well drained soil are also included.

Most of the acreage of this Boonesboro soil is in pasture, hay, woods, or brush. It is suited to row crops, which produce high yields in most seasons. Flooding, and in dry seasons, the available water capacity limit production. This soil can be cropped year after year if it is properly fertilized and if organic matter content is maintained. Minimum tillage, return of crop residue to the soil, use of cover crops, and inclusion of grasses and legumes in the cropping system help to maintain desirable soil structure and organic matter content.

This soil is well suited to pasture and hay. It is not well suited to deep-rooted plants such as alfalfa. The desired species should be maintained through frequent renovation of pasture. Application of lime and fertilizer, maintenance of proper stocking rates, use of rotational grazing, and control of undesirable vegetation are needed.

This soil is well suited to black walnut, eastern cottonwood, sweetgum, white ash, shortleaf pine, and yellow-poplar. Plant competition is a management concern.

This soil is poorly suited to most urban uses because of flooding and the moderate depth to rock.

This soil is in capability subclass IIs and woodland group 1o.

BsE—Brassfield-Beasley complex, 20 to 30 percent slopes. This map unit consists of Brassfield and Beasley soils in areas so intermingled that they could not be separated at the scale selected for mapping. These soils occur mostly in long, winding areas on hillsides that are dissected by many small drainageways. The moderately deep, well drained Brassfield soil occurs on the lower side slopes, and the deep, well drained Beasley soil occurs on the upper slopes and convex hilltops. Individual areas of each soil are 1 to 10 acres.

The Brassfield soil makes up about 50 percent of this map unit. Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil, extending to a depth of 24 inches, is brownish yellow loam. Soft, pale olive siltstone and shale are at a depth of 24 inches.

The Brassfield soil has moderate available water capacity and moderate permeability. Runoff is medium. Natural fertility is medium, and organic matter content is low. Reaction ranges from neutral to moderately alkaline. The root zone is moderately deep. Soft bedrock is at a depth of 20 to 40 inches.

The Beasley soil makes up about 30 percent of this map unit. Typically, the surface layer is brown silt loam about 5 inches thick. The subsoil extends to a depth of 39 inches. It is strong brown silty clay and clay in the upper 18 inches and mottled brown, pale brown, and pale olive clay in the lower 16 inches. The substratum, about 4 inches thick, is mottled dark yellowish brown, light brownish gray, and yellowish brown silty clay. Soft calcareous shale, siltstone, and limestone are at a depth of 43 inches.

The Beasley soil has high available water capacity and moderately slow permeability. Runoff is rapid. Natural fertility is medium, and organic matter content is low. Reaction ranges from very strongly acid to neutral in the upper part of the soil and from neutral to moderately alkaline in the lower part. The lower part of the soil is calcareous. The root zone is moderately deep.

Included with these soils in mapping are small areas of Fairmount soils. Also included are small areas of soils that have a very dark grayish brown silty clay surface layer and a light olive brown heavy silty clay loam subsoil and that are underlain by calcareous limestone, shale, and siltstone.

These Brassfield and Beasley soils are mostly in pasture, but some areas are idle or in brush or woods. They are poorly suited to row crops and for most urban uses. They are suitable for trees or grasses.

The hazard of erosion is too severe for these soils to be used for cultivated crops. Although the soils are suited to pasture and hay, harvesting of hay is difficult on the steep slopes. Because of the steep slopes and the erosion hazard, ground cover should be maintained. Pasture mixtures should produce satisfactory forage, provide adequate ground cover, and require infrequent renovation. Application of lime and fertilizer, maintenance of proper stocking rates, use of rotational grazing, and control of undersirable vegetation are needed.

The Brassfield soil is suitable for eastern redcedar, Virginia pine, and Scotch pine. The Beasley soil is suitable for shortleaf pine, loblolly pine, eastern white pine, black locust, and white ash. The erosion hazard and the equipment limitation are management concerns because of the steep slopes and the clayey subsoil.

These soils are poorly suited to most urban uses because of the steep slopes, the limited depth over bedrock, and the clayey subsoil.

The soils are in capability subclass VIe. The Brassfield soil is in woodland group 4d, and the Beasley soil is in woodland group 3c.

CrB—Crider silt loam, 2 to 6 percent slopes. This deep, well drained soil is on fairly broad upland ridges. Slopes are slightly convex and range from 150 to 600 feet in length. Some areas of this soil have karst topography. This soil occurs in long, narrow to broad areas that range from 5 to 100 acres or more.

Typically, the surface layer is brown silt loam about 10 inches thick. The subsoil extends to a depth of 84 inches or more. It is brown and strong brown silt loam and silty clay loam in the upper 25 inches, yellowish red silty clay loam in the next 13 inches, and red silty clay and clay below.

Available water capacity is high, and permeability is moderate. Runoff is medium. Natural fertility is high, and organic matter content is moderate. Reaction is strongly acid to moderately alkaline. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. The root zone is deep. The lower part of the subsoil has moderate shrink-swell potential.

Included with this soil in mapping are small areas of Beasley and Nicholson soils and a few areas where the silt mantle is less than 20 inches thick. In some places, depth to bedrock ranges from 3.5 to 5 feet. Also included are areas of similar soils that formed in old alluvium and that have more chert fragments in the lower subsoil and in the substratum than Crider soil.

Most of this Crider soil is cleared for cultivated crops, hay, and pasture. It is well suited to farming and to most urban uses. Crops commonly grown in the area, such as corn, tobacco, small grains, pasture, and hay, are suited to this soil. Crops respond well to fertilizer and lime. The erosion hazard is moderate; some measures for controlling erosion are needed if cultivated crops are grown. Contour tillage, stripcropping, minimum tillage, return of crop residue to the soil, use of cover crops, and inclusion of grasses and legumes in the cropping system help to control erosion and maintain organic matter content.

This soil is well suited to the pasture and hay plants commonly grown in the area. If properly managed, it produces high yields. Plants selected for pasture and hay should produce adequate forage and provide satisfactory ground cover. The desired species should be maintained through frequent renovation of pasture. Application of lime and fertilizer, maintenance of proper stocking rates, use of rotational grazing, and control of undesirable vegetation are needed.

Although most areas are cleared, this soil is well suited to eastern white pine, yellow-poplar, black walnut, loblolly pine, and white ash. Plant competition is a management concern.

This soil is well suited to most urban uses. Low strength is a limitation for local roads and streets, and moderate shrink-swell potential is a limitation for buildings.

This soil is in capability subclass IIe and woodland group 1o.

EcC—Eden silty clay loam, 6 to 20 percent slopes. This moderately deep, well drained soil is on sloping ridgetops. Slopes range from 100 to 300 feet in length. This soil occurs in long, winding areas on narrow ridges. Areas range from 5 to 100 acres.

Typically, the surface layer is yellowish brown silty clay loam about 6 inches thick. The subsoil, extending to a depth of 26 inches, is light olive brown silty clay with

pale olive and yellowish brown mottles. The underlying material, to a depth of 50 inches or more, is soft, weathered, interbedded shale, siltstone, and limestone.

Available water capacity is moderate, and permeability is slow. Runoff is rapid. Natural fertility is medium, and organic matter content is low. Reaction ranges from strongly acid to moderately alkaline in the upper part of the soil and from mildly alkaline to moderately alkaline in the lower part. This soil is somewhat difficult to till. The root zone is moderately deep. The shrink-swell potential is moderate.

Included with this soil in mapping are small areas of Faywood and Lowell soils. Some areas have a thin silt mantle, and some small areas have slopes of less than 6 percent.

This Eden soil is used for pasture, hay, and cultivated crops. It is poorly suited to row crops and most urban uses. Although this soil is suited to occasional cultivation, it is better suited to pasture and hay. Response of crops to fertilizer and lime is fair. This soil is somewhat difficult to till because the surface layer consists partly of subsoil material. The hazard of erosion is severe; some measures for controlling erosion are needed if cultivated crops are grown. Contour tillage, stripcropping, minimum tillage, return of crop residue to the soil, use of cover crops, and inclusion of grasses and legumes in the cropping system help to control erosion and maintain organic matter content.

This soil is suited to pasture and hay. If properly managed, it produces moderate yields. Plants selected for pasture and hay should provide satisfactory ground cover to prevent erosion. The desired species should be maintained through frequent renovation of pasture. Application of lime and fertilizer, maintenance of proper stocking rates, use of rotational grazing, and control of undesirable vegetation are needed.

Although most areas are cleared, this soil is suited to eastern redcedar, Virginia pine, Scotch pine, and Austrian pine. Erosion hazard, equipment limitation, and seedling mortality are the main management concerns.

This soil is poorly suited to most urban uses because of slow permeability, clayey texture, steepness of slope, moderate shrink-swell potential, and the moderate depth to rock.

This soil is in capability subclass IVe and woodland group 3c.

EdE3—Eden flaggy silty clay, 20 to 30 percent slopes, severely eroded. This moderately deep, steep, well drained soil is on hillsides. Slopes are mostly convex and smooth and range from 200 to 800 feet in length. This soil occurs in long narrow bands to broad areas that are dissected by small drainageways every 300 to 1,000 feet. Areas range from 10 to several hundred acres. Most areas of this soil are severely eroded, and some areas have a few deep gullies. Some areas on north-facing slopes are slightly or moderately eroded.

Typically, the surface layer is olive brown flaggy silty clay about 6 inches thick. The subsoil, to a depth of 25 inches, is light olive brown flaggy silty clay with yellowish brown and pale olive mottles in the lower 6 inches. The underlying material, to a depth of 50 inches or more, consists of soft calcareous shale and thin-bedded limestone.

Available water capacity is moderate, and permeability is slow. Runoff is rapid. Natural fertility is medium, and organic matter content is low. Reaction ranges from strongly acid to moderately alkaline in the surface layer and subsoil and from mildly alkaline to moderately alkaline in the substratum. This soil is somewhat difficult to till because of the silty clay texture and the flagstones in the soil. The root zone is moderately deep. The shrink-swell potential is moderate.

Included with this soil in mapping are small areas of Lowell, Faywood, and Fairmount soils. Some areas are free of flagstones, and some slopes are more than 30 percent.

Most of this Eden soil is in woods or brush, and a few areas are used for pasture. The soil is poorly suited to row crops and pasture. The steep slopes, erosion hazard, and flagstones limit the use of this soil for cultivated crops and hinder the use of farm machinery. Because of the steep slopes and erosion hazard, management of vegetation for ground cover and soil protection is most important. Plants selected for pasture should provide adequate ground cover and require infrequent renovation. Application of lime and fertilizer, maintenance of proper stocking rates, use of rotational grazing, and control of undesirable vegetation are needed.

This soil is suited to eastern redcedar, Virginia pine, and Scotch pine. The erosion hazard, seedling mortality, and equipment limitation are management concerns.

This soil is poorly suited for urban uses because of the steep slopes, clayey subsoil, slow permeability, and moderate depth to bedrock.

This soil is in capability subclass VIIe and woodland group 4c.

ElA—Elk silt loam, 0 to 2 percent slopes. This deep, well drained, nearly level soil is on stream terraces. Flooding is rare. Areas are long and narrow to broad and range from 5 to 50 acres.

Typically, the surface layer is brown silt loam about 8 inches thick. The subsoil, to a depth of 56 inches, is brown silt loam and silty clay loam. The substratum, to a depth of 65 inches or more, is brown silty clay loam.

Available water capacity is high, and permeability is moderate. Runoff is medium. Natural fertility is high, and organic matter content is moderate. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. In unlimed areas, the surface layer and subsoil range from slightly acid to strongly acid. The root zone is deep.

Included with this soil in mapping are small areas of Otwell and Nolin soils. Also included are small areas of soils with a darker colored surface layer than is typical for the Elk soil. In some places these soils are underlain by clayey residuum.

This Elk soil is used extensively for corn, small grains, soybeans, and tobacco, and some areas are used for hay and pasture. The soil is well suited to all the cultivated crops commonly grown in the area. Crops respond well to fertilizer and lime. The erosion hazard is slight, and cultivated crops can be grown year after year if good management is used to maintain fertility and organic matter content. Minimum tillage, return of crop residue to the soil, use of cover crops, and inclusion of grasses and legumes in the cropping system help to maintain soil structure and organic matter content.

This soil is suited to the pasture and hay plants commonly grown in the area. Control of weeds, maintenance of proper stocking rates, use of rotational grazing, application of lime and fertilizer, and control of undesirable species are needed.

This soil is well suited to eastern white pine, yellow-poplar, black walnut, and loblolly pine. Plant competition is a management concern.

This soil is suited to urban uses. Flooding is a limitation for buildings, local roads and streets, and some other uses, and low strength is a limitation for local roads and streets.

This soil is in capability class I and woodland group 2o.

ElB—Elk silt loam, 2 to 6 percent slopes. This deep, well drained soil is on stream terraces and alluvial fans. Areas are long and narrow to broad and range from 5 to 30 acres or more.

Typically, the surface layer is brown silt loam about 8 inches thick. The subsoil, to a depth of 56 inches, is brown silt loam and silty clay loam. The substratum, to a depth of 65 inches or more, is brown silty clay loam.

Available water capacity is high, and permeability is moderate. Runoff is medium. Natural fertility is high, and organic matter content is moderate. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. In unlimed areas, the surface layer and subsoil range from slightly acid to strongly acid. The root zone is deep.

Included with this soil in mapping are small areas of Otwell and Nolin soils. Also included are small areas of soils with a darker colored surface layer than is typical for the Elk soil. In some places this soil includes areas where the lower subsoil and substratum consists of clayey residuum. Low terraces are susceptible to flooding.

This Elk soil is used extensively for corn, tobacco, small grains, soybeans, hay, and pasture. It is well suited to all of the cultivated crops commonly grown in the area. Crops respond well to fertilizer and lime. The erosion hazard is moderate; some measures for controlling erosion are needed if cultivated crops are grown. Contour tillage, stripcropping, minimum tillage, return of crop residue to the soil, use of cover crops, and inclusion of grasses and legumes in the cropping system help to control erosion and maintain organic matter content.

This soil is suited to the pasture and hay plants commonly grown in the area. If properly managed, it produces high yields. Plants selected for pasture and hay should produce adequate forage and provide satisfactory ground cover. The desired species should be maintained through frequent renovation of pasture. Application of lime and fertilizer, maintenance of proper stocking rates, use of rotational grazing, and control of undesirable vegetation are needed.

Although most areas are cleared, this soil is well suited to eastern white pine, yellow-poplar, black walnut, and loblolly pine. Plant competition is a management concern.

This soil is well suited to most urban uses. Low strength is a limitation for local roads and streets. A few low areas that are subject to flooding are poorly suited to most urban uses.

This soil is in capability subclass IIe and woodland group 2o.

ElC—Elk silt loam, 6 to 12 percent slopes. This deep, well drained soil is on stream terraces. Areas are mostly long and narrow and range from 3 to 12 acres.

Typically, the surface layer is brown silt loam about 8 inches thick. The subsoil, to a depth of 56 inches, is brown silt loam and silty clay loam. The substratum, to a depth of 65 inches or more, is brown silty clay loam.

Available water capacity is high, and permeability is moderate. Runoff is medium. Natural fertility is high, and organic matter content is moderate. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. In unlimed areas, the surface layer and subsoil range from slightly acid to strongly acid. The root zone is deep.

Included with this soil in mapping are small areas of Shelbyville soils. Also included are small areas of soils that have more red in the subsoil than is typical for the Elk soil.

Most of this Elk soil is used for cultivated crops, hay, and pasture. It is suited to the row crops and small grains commonly grown in the area. Adapted crops include corn and tobacco. Crops respond well to fertilizer and lime. The erosion hazard is severe; measures for erosion control are needed if cultivated crops are grown. Contour tillage, stripcropping, minimum tillage, return of crop residue to the soil, use of cover crops, and inclusion of grasses and legumes in the cropping system help to control erosion and maintain organic matter content.

This soil is suited to alfalfa and other hay and pasture plants commonly grown in the area. If properly managed, it produces high yields. Plants selected for hay and pasture should produce adequate forage and provide satisfactory ground cover. The desired species should be maintained through frequent renovation of pasture. Application of lime and fertilizer, maintenance of proper stocking rates, use of rotational grazing, and control of undesirable vegetation are needed.

Although most areas are cleared, this soil is suited to eastern white pine, yellow-poplar, black walnut, and loblolly pine. Plant competition is a management concern.

This soil is suited to most urban uses. Steepness of slope is the main limitation.

This soil is in capability subclass IIIe and woodland group 2o.

FaC—Faywood silt loam, 6 to 12 percent slopes. This moderately deep, well drained soil is on sloping convex ridgetops and convex side slopes. Slopes range from 150 to 400 feet in length. Some areas of this soil have karst topography. This soil occurs in long, narrow areas on ridges and in long, winding areas dissected by small drainageways. Areas range from 5 to 50 acres.

Typically, the surface layer is brown silt loam about 6 inches thick. The subsoil, to a depth of 26 inches, is strong brown and yellowish brown silty clay. The substratum, about 4 inches thick, is light olive brown silty clay that is underlain by limestone bedrock at a depth of 30 inches.

Available water capacity is moderate, and permeability is moderately slow to slow. Natural fertility is medium, and organic matter content is low. Reaction ranges from strongly acid to neutral in the upper part of the soil and from slightly acid to mildly alkaline in the lower part. This soil is easy to till except in some areas that are eroded and clayey. The root zone extends to bedrock at a depth of 20 to 40 inches. The subsoil has moderate shrink-swell potential.

Included with this soil in mapping are small areas of Lowell, Beasley, and Eden soils. Also included are small areas of severely eroded Faywood and Lowell soils and some areas that have flagstones and rock outcrops.

Most of this Faywood soil is in pasture or hay, but some areas are used for cultivated crops. Although this soil is suited to cultivated crops, it is better suited to pasture and hay. Response of crops to fertilizer and lime is fair. Some areas of this soil are somewhat difficult to till because the surface layer consists partly of subsoil material. The hazard of erosion is severe; some measures for controlling erosion are needed if cultivated crops are grown. Contour tillage, stripcropping, minimum tillage, return of crop residue to the soil, use of cover crops, and inclusion of grasses and legumes in the cropping system help to control erosion and maintain organic matter content.

This soil is suited to pasture and hay. If properly managed, it produces moderate yields. Plants selected for hay and pasture should provide satisfactory ground cover to prevent further erosion. The desired species should be maintained through frequent renovation of pasture. Application of lime and fertilizer, maintenance of proper stocking rates, use of rotational grazing, and control of undesirable vegetation are needed.

Although most areas are cleared, this soil is suited to shortleaf pine, loblolly pine, eastern white pine, black locust, and eastern redcedar. Plant competition is a management concern.

This soil is poorly suited to most urban uses because of moderate shrink-swell potential, clayey texture, moderately slow to slow permeability, and moderate depth to bedrock.

This soil is in capability subclass IIIe and woodland group 3c.

FdD—Faywood silty clay loam, 12 to 20 percent slopes. This moderately deep, well drained soil is on moderately steep side slopes. Slopes are mostly smooth or concave and range from 150 to 300 feet in length. This soil occurs in long, narrow areas that parallel drainageways. Areas range from 5 to 30 acres.

Typically, the surface layer is brown silty clay loam about 6 inches thick. The subsoil, to a depth of 26 inches, is strong brown and yellowish brown silty clay. The substratum, about 4 inches thick, is light olive brown silty clay that is underlain by limestone bedrock at a depth of 30 inches.

Available water capacity is moderate, and permeability is moderately slow to slow. Natural fertility is medium, and organic matter content is low. Reaction ranges from strongly acid to neutral in the upper part of the soil and from slightly acid to mildly alkaline in the lower part. This soil is somewhat difficult to till because of the silty clay loam surface texture. The root zone extends to bedrock at a depth of 20 to 40 inches. The subsoil has moderate shrink-swell potential.

Included with this soil in mapping are small areas of Lowell, Fairmount, Eden, and Beasley soils. Also included are small areas of severely eroded Faywood and Eden soils that have occasional deep gullies and some areas that have flagstones and rock outcrops.

Most of this Faywood soil is in pasture and hay, but some areas are in woods or are idle. Although this soil is suited to occasional cultivation, it is better suited to pasture and hay. If this soil is cultivated, the hazard of erosion is very severe; some measures for controlling erosion and reducing runoff are needed. Contour tillage, stripcropping, minimum tillage, return of crop residue to the soil, use of cover crops, and inclusion of grasses and legumes in the cropping system help to control erosion and maintain organic matter content.

This soil is suited to pasture and hay. If properly managed, it produces moderate yields. The root zone extends to a depth of 20 to 40 inches. During dry seasons crop production is limited because of the low moisture content of the soil. Plants selected for pasture and hay should produce adequate forage and provide satisfactory ground cover. The desired species should be maintained through frequent renovation of pasture. Application of lime and fertilizer, maintenance of proper stocking rates, use of rotational grazing, and control of undesirable vegetation are needed.

This soil is suited to shortleaf pine, loblolly pine, eastern white pine, black locust, and eastern redcedar. Erosion hazard and equipment limitation are management concerns because of the moderately steep slopes and

the clayey subsoil. Plant competition is also a management concern.

This soil is poorly suited to most urban uses because of the moderately steep slopes, clayey subsoil, moderate depth to rock, and moderately slow to slow permeability.

This soil is in capability subclass IVe and woodland group 3c.

LoB—Lowell silt loam, 2 to 6 percent slopes. This deep, well drained soil is on upland ridges. Slopes are convex and range from 150 to 500 feet in length. Some areas of this soil have karst topography. This soil occurs mostly in long narrow areas that range from 5 to 50 acres or more.

Typically, the surface layer is yellowish brown silt loam about 8 inches thick. The subsoil, to a depth of 50 inches, is strong brown silty clay loam in the upper 9 inches, strong brown silty clay in the next 11 inches, and mottled yellowish brown, brownish yellow, and light brownish gray clay in the lower 22 inches. Hard limestone is at a depth of 50 inches.

Available water capacity is high, and permeability is moderately slow. Runoff is medium. Natural fertility is medium, and organic matter content is moderate. Reaction ranges from slightly acid to very strongly acid in the upper 30 inches except in limed areas and from strongly acid to mildly alkaline below 30 inches. This soil is easy to till. The root zone is deep. The shrink-swell potential is moderate.

Included with this soil in mapping are small areas of Faywood, Beasley, Nicholson, and Shelbyville soils. In some areas there is a silt mantle to a depth of 16 inches.

Most of this Lowell soil is cleared for cultivated crops, hay, and pasture. It is well suited to the row crops and small grains commonly grown in the area. Adapted crops include corn and tobacco. Crops respond well to fertilizer and lime. The erosion hazard is moderate; some measures for controlling erosion are needed if cultivated crops are grown. Contour tillage, stripcropping, minimum tillage, return of crop residue to the soil, use of cover crops, and inclusion of grasses and legumes in the cropping system help to control erosion and maintain organic matter content.

This soil is well suited to the pasture and hay plants commonly grown in the area. If properly managed, it produces high yields. Plants selected for pasture and hay should produce adequate forage and provide satisfactory ground cover. The desired species should be maintained through frequent renovation of pasture. Application of lime and fertilizer, maintenance of proper stocking rates, use of rotational grazing, and control of undesirable vegetation are needed.

This soil is well suited to yellow-poplar, eastern white pine, shortleaf pine, and Virginia pine. Plant competition is a management concern.

This soil is suited to urban uses, but the moderately slow permeability, moderate shrink-swell potential, clayey texture, and moderate depth to rock severely limit its use for some developments.

This soil is in capability subclass IIe and woodland group 2c.

LoC—Lowell silt loam, 6 to 12 percent slopes. This deep, well drained soil is on sloping, convex ridgetops and concave side slopes. Slopes range from 150 to 700 feet in length. Some areas of this soil have karst topography. This soil occurs in long narrow areas on ridges and long winding areas dissected by many small drainageways. Areas range from 5 to 100 acres or more.

Typically, the surface layer is brown silt loam about 6 inches thick. The subsoil, to a depth of 50 inches, is yellowish brown silty clay in the upper 18 inches and yellowish brown, light olive brown, and olive clay in the lower 26 inches. Hard limestone is at a depth of 50 inches.

Available water capacity is high, and permeability is moderately slow. Runoff is rapid. Natural fertility is medium, and organic matter content is moderate. Reaction ranges from slightly acid to very strongly acid in the upper 30 inches except in limed areas and from strongly acid to mildly alkaline below 30 inches. This soil is easy to till. The root zone is deep, and the shrink-swell potential is moderate.

Included with this soil in mapping are small areas of Faywood, Beasley, and Shelbyville soils. Also included are long narrow areas of bottom land soils along drainageways and small areas of severely eroded Lowell soils.

Most of this Lowell soil is cleared for hay, pasture, and cultivated crops. Response of crops to fertilizer and lime is fair. This soil is somewhat difficult to till because the surface layer consists partly of subsoil material. The hazard of erosion is severe; some measures for controlling erosion are needed if cultivated crops are grown. Contour tillage, stripcropping, minimum tillage, return of crop residue to the soil, use of cover crops, and inclusion of grasses and legumes in the cropping system help to control erosion and maintain organic matter content.

This soil is well suited to the pasture and hay plants commonly grown in the area. If properly managed, it produces moderate yields (fig. 10). Plants selected for pasture and hay should provide satisfactory ground cover to prevent further erosion. The desired species should be maintained through frequent renovation of pasture. Application of lime and fertilizer, maintenance of proper stocking rates, use of rotational grazing, and control of undesirable vegetation are needed.

Although most areas are cleared, this soil is well suited to yellow-poplar, eastern white pine, shortleaf pine, Virginia pine, and loblolly pine. Plant competition is a management concern.

This soil is suited to most urban uses. Moderately slow permeability, moderate shrink-swell potential, steepness of slopes, and clayey texture are limitations for most uses.

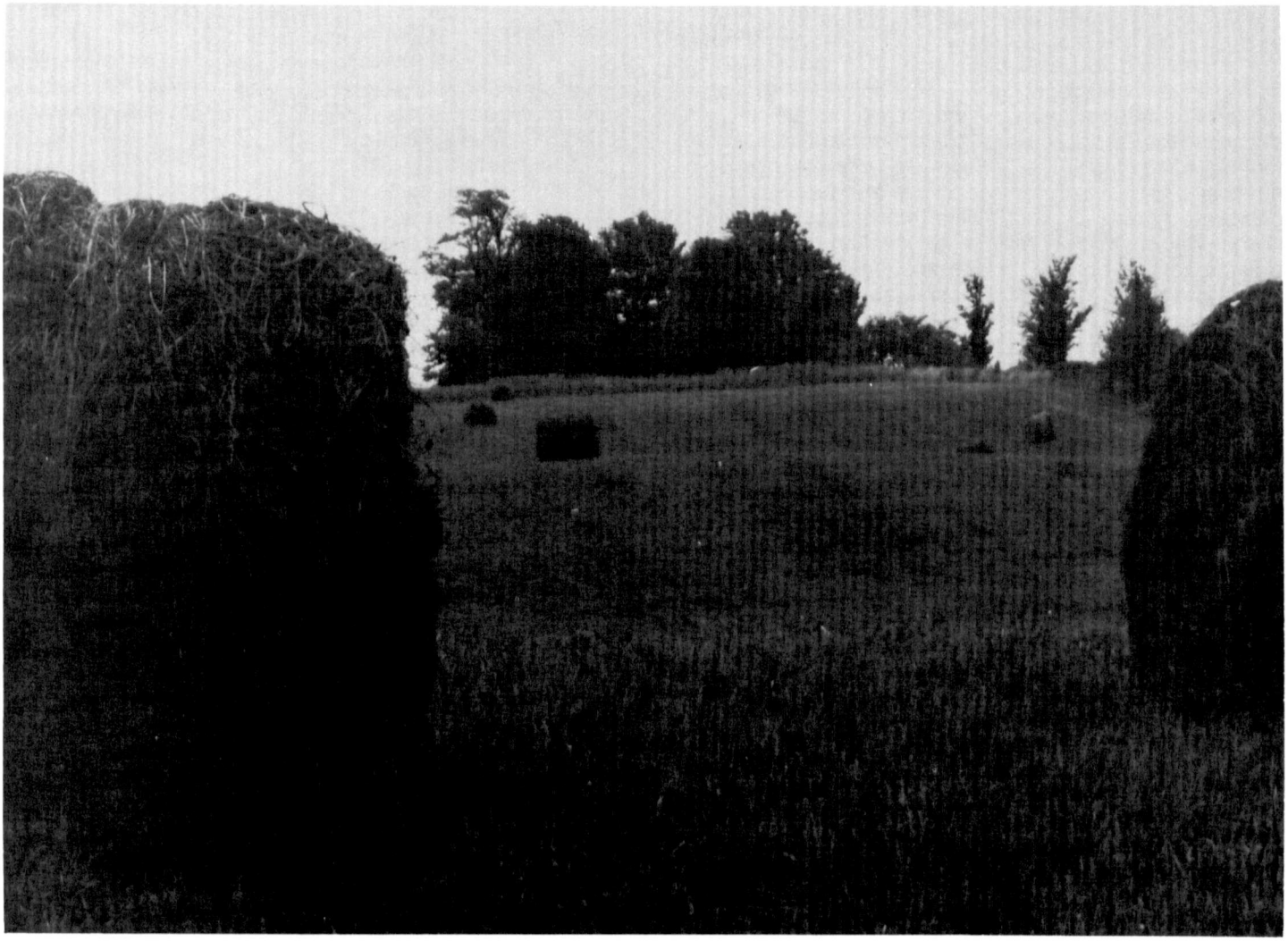


Figure 10.—Hay in large rolls on Lowell silt loam, 6 to 12 percent slopes.

This soil is in capability subclass IIIe and woodland group 2c.

LsC3—Lowell silty clay loam, 6 to 12 percent slopes, severely eroded. This deep, well drained soil is on sloping convex ridgetops and concave side slopes. Slopes range from 150 to 700 feet in length. Some areas of this soil have karst topography. This soil occurs mostly on side slopes dissected by many small drainageways. Areas range from 5 to 30 acres or more. In most places this soil has lost most of the original surface layer. In some places there are a few deep gullies and small areas where most of the subsoil has been eroded.

Typically, the surface layer is brown silty clay loam about 5 inches thick. The subsoil, to a depth of 39 inches, is yellowish brown silty clay in the upper 15 inches and yellowish brown and olive brown clay in the lower 24 inches. Hard limestone is at a depth of 44 inches.

Available water capacity is high, and permeability is moderately slow. Runoff is rapid. Natural fertility is medium, and organic matter content is low. Reaction ranges from slightly acid to very strongly acid in the upper 30 inches except in limed areas and from strongly acid to mildly alkaline below 30 inches. The root zone is deep. The silty clay loam texture of the plow layer makes this soil somewhat difficult to till. The shrink-swell potential is moderate.

Included with this soil in mapping are small areas of severely eroded Faywood, Eden, and Beasley soils. Also included are some uneroded areas of these soils.

Most of this Lowell soil is in woods, brush, hay, or pasture. This soil is poorly suited to row crops. Although it is suited to occasional cultivation, it is better suited to hay, pasture, woodland, or wildlife habitat. Response of crops to fertilizer and lime is fair. This soil is difficult to till because the surface layer consists mostly of subsoil material. The hazard of erosion is very severe; some measures for controlling erosion are needed if cultivated crops are grown. Contour tillage, stripcropping, minimum tillage, return of crop residue to the soil, use of cover crops, and inclusion of grasses and legumes in the cropping system help to control erosion and maintain organic matter content.

This soil is suited to pasture and hay. If properly managed, it produces moderate yields. Plants selected for pasture and hay should provide satisfactory ground cover to prevent further erosion. The desired species should be maintained through frequent renovation of pasture. Application of lime and fertilizer, maintenance of proper stocking rates, use of rotational grazing, and control of undesirable vegetation are needed.

This soil is suited to Virginia pine, shortleaf pine, and loblolly pine. Equipment limitation, plant competition, and seedling mortality are management concerns.

This soil is suited to urban uses, but because of moderately slow permeability, moderate shrink-swell potential, and clayey texture, it is poorly suited to some uses.

This soil is in capability subclass IVe and woodland group 3c.

LWE—Lowell-Eden association, steep. This map unit consists of deep and moderately deep, well drained soils. The composition of this association is more variable than that of other map units in the county. This variability, however, does not affect the anticipated use of the soils. The landscape consists of an uplifted area with many faults and folds. Hillsides are steep, and ridgetops are narrow and convex. The Lowell soil is on upper slopes, side slopes, and convex hilltops, and the Eden soil is on convex ridges and upper side slopes. These soils formed in material weathered from limestone and calcareous shale. Most areas have coarse fragments of chert or flat fragments of limestone on the surface. Slopes range from 20 to 40 percent but are dominantly 25 to 35 percent. This map unit is mostly in one area of several hundred acres.

The Lowell soil makes up about 40 percent of this map unit. Typically, the surface layer is very dark grayish brown cherty silt loam about 5 inches thick. The subsurface layer is dark yellowish brown cherty silt loam about 4 inches thick. The upper part of the subsoil is strong brown silty clay, and the lower part is strong brown clay and cherty silty clay that extends to a depth of 47 inches. The substratum is mottled light yellowish brown, yellowish brown, and light gray silty clay to a depth of 62 inches or more.

The Lowell soil has high available water capacity and moderately slow permeability. Runoff is rapid. Natural fertility is medium, and organic matter content is moderate. Reaction ranges from slightly acid to very strongly acid in the upper 30 inches except in limed areas and from strongly acid to mildly alkaline below 30 inches. The root zone is deep. Chert in the plow layer makes this soil somewhat difficult to till. The shrink-swell potential is moderate.

The Eden soil makes up about 25 percent of this unit. Typically, the surface layer is grayish brown silty clay loam about 7 inches thick. Chert and limestone fragments make up 10 percent of the surface layer. The subsoil, extending to a depth of 36 inches, is yellowish brown clay and silty clay. Chert and limestone fragments make up 15 percent of the subsoil. The substratum is gravelly silty clay loam to a depth of 53 inches or more.

The Eden soil has moderate available water capacity and slow permeability. Runoff is rapid. Natural fertility is medium, and organic matter content is low. Reaction ranges from slightly acid to moderately alkaline in the surface layer and subsoil and from mildly alkaline to moderately alkaline in the substratum. The root zone is moderately deep. The silty clay loam texture of the surface layer makes this soil somewhat difficult to till. The shrink-swell potential is moderate.

Included with these soils in mapping are small areas of Faywood, Beasley, and Woolper soils, and small areas of rock outcrops and large boulders.

Most of these Lowell and Eden soils are in woods or brush, but a few small areas are in pasture. These soils are poorly suited to row crops, hay, pasture, and urban uses. They are better suited to trees and as habitat for woodland wildlife.

These soils are poorly suited to cultivated crops because of the steep slopes and the hazard of erosion. Some areas are used for pasture, but most are too steep for modern machinery. Stands of pasture grasses are difficult to establish and maintain. If these soils are used for pasture, the grasses and legumes selected should produce good plant cover and require infrequent renovation. Overgrazing and grazing of pasture when wet reduce the stand of desirable grasses and cause excessive runoff and erosion.

These soils are suited to trees. The Lowell soil is suitable for yellow-poplar, eastern white pine, shortleaf pine, and Virginia pine. The Eden soil is suitable for eastern redcedar, Virginia pine, and Scotch pine. The erosion hazard, equipment limitation, seedling mortality, and plant competition are management concerns.

These soils are poorly suited to urban uses because of the steep slopes and the clayey subsoil.

These soils are in capability subclass VIIe. The Lowell soil is in woodland group 2c, and the Eden soil is in woodland group 3c.

Mc—McGary silt loam. This deep, nearly level, somewhat poorly drained soil is on stream terraces and in upland depressions. Slopes range from 0 to 2 percent. Areas range from 5 to 30 acres or more.

Typically, the surface layer is brown silt loam about 7 inches thick. The subsoil, extending to a depth of about 45 inches, is yellowish brown silty clay loam in the upper part and mottled, light brownish gray silty clay in the lower part. The substratum extends to limestone bedrock at a depth of 69 inches. It is mottled light brownish gray, brown, and yellowish brown silty clay.

Available water capacity is high, and permeability is slow or very slow. Runoff is slow. Natural fertility and organic matter content are low. This soil is somewhat difficult to till. The subsoil is sticky and plastic and has a high shrink-swell potential. A seasonal high water table is at a depth of 1 to 3 feet. Reaction ranges from slightly acid to strongly acid in the upper part of this soil and from medium acid to mildly alkaline in the lower part. The root zone is deep.

Included with this soil in mapping are small areas of Otwell and Newark soils and areas of a soil that is similar to this McGary soil except that it is moderately well drained. Also included are small areas of poorly drained soils on bottom lands.

Most of the acreage of this McGary soil is in hay and pasture. A smaller acreage is used for corn and soybeans. This soil is suited to cultivated crops, but wetness, caused by slow surface runoff and slow permeability, limits its use for some crops. Where properly drained, this soil is commonly used for corn and soybeans, but crops are damaged by wetness in some years. Tobacco is seldom grown on this soil. Response of crops to fertilizer and lime is fair. The hazard of erosion is slight. Open ditch drainage, in combination with grassed waterways, is generally the best drainage system to correct wetness. Minimum tillage, return of crop residue to the soil, use of cover crops, and inclusion of grasses and legumes in the cropping system help to maintain desirable structure and organic matter content.

If properly managed, this soil is suited to pasture and hay, but it is better suited to plants that will tolerate some wetness. The desired species should be maintained through frequent renovation of pasture. Application of lime and fertilizer, maintenance of adequate drainage, maintenance of proper stocking rates, use of rotational grazing, and control of undesirable vegetation are needed.

Although most areas are cleared, this soil is suited to eastern white pine, white ash, red maple, American sycamore, and yellow-poplar. Equipment limitation, caused by the seasonal high water table, and plant competition are management concerns.

This soil is poorly suited to most urban uses. Slow permeability and clayey texture are limitations for sanitary facilities. Clayey texture, wetness, and high shrink-swell potential are limitations for shallow excavations, buildings, and local roads and streets. Low strength is also a limitation for local roads and streets.

This soil is in capability subclass IIIw and woodland group 3w.

Ne—Newark silt loam. This deep, nearly level, somewhat poorly drained soil is on flood plains. Slopes are uniform to slightly concave and range from 0 to 2 percent. Areas are mostly long and narrow and range from 5 to 30 acres.

Typically, the surface layer is grayish brown silt loam about 9 inches thick. The subsoil, extending to a depth of 32 inches, is grayish brown silt loam with pale brown and dark brown mottles in the lower part. The substratum is gray silty clay loam to a depth of 50 inches and gray, brown, and yellowish brown silty clay loam to a depth of 70 inches or more.

Available water capacity is high, and permeability is moderate. Runoff is very slow. Natural fertility is high, and organic matter content is moderate. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. Reaction ranges from medium acid to mildly alkaline. This soil is subject to occasional flooding. The seasonal high water table is at a depth of 6 to 18 inches.

Included with this soil in mapping are small areas of moderately well drained and poorly drained soils. Also included are small areas of a poorly drained soil that has a thick dark surface layer and a clayey subsoil.

Most of the acreage of this Newark soil is in row crops, hay, and pasture. If drained, it is well suited to corn and soybeans. Tobacco is seldom grown on this soil. Flooding and a seasonal high water table at a depth of 6 to 18 inches are the main limitations to the use of this soil for crops. Flooding usually occurs, however, in late winter and early spring before crops are planted. Tile drainage systems are commonly used to correct wetness. Crops can be grown year after year if the soil is properly fertilized and organic matter content is maintained. Minimum tillage, return of crop residue to the soil, use of cover crops, and inclusion of grasses and legumes in the cropping system help to maintain desirable soil structure and organic matter content.

This soil is well suited to pasture and hay plants that will tolerate some wetness. Some hay plants are damaged by flooding. The desired species should be maintained through frequent renovation of pasture. Application of lime and fertilizer, adequate drainage, maintenance of proper stocking rates, use of rotational grazing, and control of undesirable vegetation are needed.

Although most areas are cleared, this soil is suited to eastern cottonwood, sweetgum, white ash, post oak, loblolly pine, American sycamore, red maple, and yellow-poplar. Plant competition and equipment limitation caused by the seasonal high water table are management concerns.

This soil is poorly suited to most urban uses because of flooding and wetness.

This soil is in capability subclass IIw and woodland group 1w.

NhB—Nicholson silt loam, 2 to 6 percent slopes. This deep, moderately well drained soil is on ridgetops.

Slopes range from 150 to 300 feet in length. Some areas of this soil have slight karst topography. This soil occurs on long, narrow to fairly broad winding ridges. Areas range from 5 to 100 acres or more.

Typically, the surface layer is brown silt loam about 10 inches thick. The subsoil, to a depth of 69 inches, is strong brown silty clay loam in the upper 16 inches underlain by a brittle and compact fragipan about 11 inches thick. The fragipan consists of yellowish brown silty clay loam with brown and light gray mottles. The lower part of the subsoil, below the fragipan, consists of brown silty clay with light gray mottles.

Available water capacity is moderate. Permeability is moderate above the fragipan and slow in the fragipan. Runoff is medium. Natural fertility is medium, and organic matter content is moderate. Reaction ranges from very strongly acid to slightly acid through the fragipan except in limed areas and from strongly acid to mildly alkaline below the fragipan. The root zone and depth to the fragipan range from 18 to 30 inches. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. The seasonal high water table is at a depth of 18 to 30 inches.

Included with this soil in mapping are small areas of Shelbyville, Otwell, and Lowell soils. Also included are some small areas of somewhat poorly drained soils on upland flats.

Most of this Nicholson soil is used for hay, pasture, and cultivated crops. This soil is well suited to most cultivated crops. Tobacco is affected by wetness in some areas. Crops respond well to fertilizer and lime. If this soil is cultivated, the hazard of erosion is moderate; some measures for controlling erosion and reducing runoff are needed. Contour tillage, stripcropping, minimum tillage, return of crop residue to the soil, use of cover crops, and inclusion of grasses and legumes in the cropping system help to control erosion and maintain organic matter content.

This soil is well suited to most pasture and hay plants. If properly managed, it produces high yields. The fragipan, at a depth of 18 to 30 inches, restricts rooting depth and limits production during dry seasons. Plants selected for pasture and hay should produce adequate forage and provide satisfactory ground cover. The desired species should be maintained through frequent renovation of pasture. Application of lime and fertilizer, maintenance of proper stocking rates, use of rotational grazing, and control of undesirable vegetation are needed.

Although most areas are cleared, this soil is well suited to black walnut, yellow-poplar, eastern white pine, shortleaf pine, and white ash. Plant competition is a management concern.

This soil is suited to most urban uses. Wetness and slow permeability affect septic tank filter fields and dwellings.

This soil is in capability subclass IIe and woodland group 2o.

NhC—Nicholson silt loam, 6 to 12 percent slopes. This deep, moderately well drained soil is on smooth and concave side slopes. Slopes range from 150 to 250 feet in length. Areas are usually long and narrow but some are oval and occur near the heads of drainageways. Individual areas range from 3 to 10 acres.

Typically, the surface layer is brown silt loam about 10 inches thick. The subsoil extends to a depth of 69 inches or more. It is strong brown silty clay loam in the upper 16 inches. The next 11 inches is a brittle and compact fragipan of yellowish brown silty clay loam with brown and light gray mottles. The lower part of the subsoil, below the fragipan, is brown silty clay with light gray mottles.

Available water capacity is moderate. Permeability is moderate above the fragipan and slow in the fragipan. Runoff is medium. Natural fertility is medium, and organic matter content is moderate. Reaction ranges from very strongly acid to slightly acid through the fragipan except in limed areas and from strongly acid to mildly alkaline below the fragipan. The root zone and depth to the fragipan range from 18 to 30 inches. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. The seasonal high water table is at a depth of 18 to 30 inches.

Most of this Nicholson soil is used for hay, pasture, and cultivated crops. It is suited to most cultivated crops grown in the area. Crops respond well to fertilizer and lime. If this soil is cultivated, the hazard of erosion is severe; some measures for controlling erosion and reducing runoff are needed. Contour tillage, stripcropping, minimum tillage, return of crop residue to the soil, use of cover crops, and inclusion of grasses and legumes in the cropping system help to control erosion and maintain organic matter content.

This soil is well suited to most pasture and hay plants. If properly managed, it produces high yields. The fragipan, at a depth of 18 to 30 inches, restricts rooting depth and limits production during dry seasons. Plants selected for pasture and hay should produce adequate forage and provide satisfactory ground cover. The desired species should be maintained through frequent renovation of pasture. Application of lime and fertilizer, maintenance of proper stocking rates, use of rotational grazing, and control of undesirable vegetation are needed.

Although most areas are cleared, this soil is well suited to black walnut, yellow-poplar, eastern white pine, shortleaf pine, and white ash. Plant competition is a management concern.

This soil is suited to most urban uses. Wetness, steepness of slope, and slow permeability affect septic tank filter fields and dwellings.

This soil is in capability subclass IIIe and woodland group 2o.

No—Nolin silt loam. This deep, well drained soil is on flood plains in narrow to fairly wide valleys. Slopes are

mostly uniform and are less than 2 percent. Areas range from 6 to 50 acres or more.

Typically, the surface layer is brown silt loam about 11 inches thick. The subsoil, to a depth of 52 inches, is brown silt loam. The substratum to a depth of 65 inches is dark yellowish brown silt loam.

Available water capacity is high, and permeability is moderate. Runoff is medium. Natural fertility is high, and organic matter content is moderate. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. Reaction ranges from medium acid to moderately alkaline. The root zone is deep. This soil is subject to occasional flooding. The seasonal high water table is at a depth of 3 to 6 feet.

Included with this soil in mapping are small areas of Newark, Boonesboro, and Elk soils.

This Nolin soil is well suited to row crops. Most of the acreage, except for small narrow bottom land areas, is in cultivated crops. Corn and soybeans are well suited to this soil and are the crops most commonly grown. A small acreage is used for hay, pasture, or small grains. This soil is subject to flooding in winter or early spring before crops are planted. Tobacco is seldom grown on this soil, and small grains and hay are sometimes damaged by flooding. If the soil is properly fertilized and if organic matter content is maintained, this soil is productive and can be cropped intensively. Minimum tillage, return of crop residue to the soil, use of cover crops, and inclusion of grasses and legumes in the cropping system help to maintain desirable soil structure and organic matter content.

All of the pasture and hay crops commonly grown in the area are well suited to this soil, although some hay crops may be damaged by flooding. Maintenance of the desired species, control of weeds, maintenance of proper stocking rates, use of rotational grazing, and application of fertilizer are needed.

This soil has good potential for sweetgum, yellow-poplar, eastern white pine, eastern cottonwood, cherrybark oak, and white ash. Plant competition is a management concern.

This soil is poorly suited to most urban uses because of flooding.

This soil is in capability class I and woodland group 1o.

OtB—Otwell silt loam, 2 to 6 percent slopes. This deep, moderately well drained soil is on low terraces. Slopes are uniform to slightly convex. Areas are oblong or long and narrow and range from 5 to 30 acres.

Typically, the surface layer is brown silt loam about 8 inches thick. The subsoil extends to a depth of 51 inches. It is strong brown and yellowish brown silty clay loam in the upper 17 inches. Between depths of 25 and 44 inches is a firm, brittle and compact fragipan of yellowish brown silty clay loam mottled with light brownish gray and dark yellowish brown. The lower 7 inches of the subsoil is yellowish brown, mottled silty clay loam. The substratum, to a depth of 61 inches, is brown stratified silty clay loam and silty clay mottled with light yellowish brown and brownish yellow. Limestone bedrock is at a depth of 61 inches.

Available water capacity is moderate. Permeability is moderate above the fragipan and very slow in the fragipan. Runoff is medium. Natural fertility is medium, and organic matter content is moderate. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. Reaction ranges from very strongly acid to neutral. The root zone and depth to the fragipan range from 20 to 30 inches. The seasonal high water table is at a depth of 18 to 30 inches.

Included with this soil in mapping are small areas of Newark and Elk soils.

This Otwell soil is used for cultivated crops, hay, and pasture. It is well suited to the cultivated crops commonly grown in the area such as corn, soybeans (fig. 11), and small grains. Tobacco is suited to the soil, but it is sometimes damaged by excess water. Crops respond well to fertilizer and lime. The fragipan, at a depth of about 2 feet, restricts soil drainage and rooting depth. The erosion hazard is moderate; some measures for controlling erosion are needed if cultivated crops are grown. Contour tillage, stripcropping, minimum tillage, return of crop residue to the soil, use of cover crops, and inclusion of grasses and legumes in the cropping system help to control erosion and maintain organic matter content.

This soil is well suited to most pasture and hay plants. If properly managed, it produces high yields. The fragipan restricts rooting depth and limits production during dry seasons. Alfalfa is not well suited to this soil. Plants selected for pasture and hay should produce adequate forage and provide satisfactory ground cover. The desired species should be maintained through frequent renovation of pasture. Application of lime and fertilizer, maintenance of proper stocking rates, use of rotational grazing, and control of undesirable vegetation are needed.

Although most areas are cleared, this soil is suited to eastern white pine, yellow-poplar, and white ash. Plant competition is a management concern.

This soil is suited to most urban uses. Wetness and very slow permeability in the fragipan affect septic tank filter fields and dwellings.

This soil is in capability subclass IIe and woodland group 3o.

ShB—Shelbyville silt loam, 2 to 6 percent slopes. This deep, well drained soil is on upland ridges. Slopes are mostly convex and range from 150 to 700 feet in length. Some areas of this soil have karst topography. This soil occurs in long and narrow to fairly broad areas that range from 5 to 100 acres or more.

Figure 11.—Soybeans on moderately well drained Otwell silt loam, 2 to 6 percent slopes.

Typically, the surface layer is dark brown silt loam about 9 inches thick. The subsoil extends to a depth of 65 inches or more. It is brown and strong brown silty clay loam in the upper 29 inches and dark yellowish brown, yellowish brown, and dark brown silty clay and clay in the lower 27 inches.

Available water capacity is high. Permeability is moderate in the upper part of the soil and moderately slow in the lower part. Runoff is medium. Natural fertility is high, and organic matter content is moderate. Reaction ranges from neutral to strongly acid in the upper part of the soil and from strongly acid to mildly alkaline in the lower part. This soil is easy to till. The root zone is deep. The shrink-swell potential is moderate in the lower part of the subsoil.

Included with this soil in mapping are small areas of Nicholson and Lowell soils. Also included are some soils that have a slightly redder subsoil than is typical. Also included are a few small areas where depth to rock is less than 5 feet.

Most of this Shelbyville soil is cleared for cultivated crops, hay, and pasture. It is well suited to all the cultivated crops commonly grown in the area, such as corn, tobacco, soybeans, and small grains (fig. 12). Crops respond well to fertilizer and lime. The erosion hazard is moderate; some measures for controlling erosion are needed if cultivated crops are grown. Contour tillage, stripcropping, minimum tillage, return of crop residue to the soil, use of cover crops, and inclusion of grasses and legumes in the cropping system help to control erosion and maintain organic matter content.

This soil is well suited to alfalfa and other hay and pasture plants commonly grown in the area. If properly managed, it produces high yields. Plants selected for pasture and hay should produce adequate forage and provide satisfactory ground cover. The desired species should be maintained through frequent renovation of pasture. Application of lime and fertilizer, maintenance of proper stocking rates, use of rotational grazing, and control of undesirable vegetation are needed.

Figure 12.—No-till soybeans following wheat on Shelbyville silt loam, 2 to 6 percent slopes.

This soil is well suited to eastern white pine, shortleaf pine, yellow-poplar, black walnut, and white ash. Plant competition is a management concern.

This soil is suited to most urban uses, but the moderately slow permeability of the lower part of the subsoil makes this soil poorly suited to septic tank absorption fields. The clayey texture of the subsoil is a limitation for some uses, and low strength is a limitation for local roads and streets.

This soil is in capability subclass IIe and woodland group 2o.

ShC—Shelbyville silt loam, 6 to 12 percent slopes. This deep, well drained soil is on side slopes. Slopes are smooth or concave and range from 150 to 300 feet in

length. Some areas have karst topography. Most areas are long and narrow and range from 5 to 15 acres.

Typically, the surface layer is dark brown silt loam about 9 inches thick. The subsoil extends to a depth of 5 inches. It is brown and strong brown silty clay loam in the upper 29 inches and dark yellowish brown and yellowish brown silty clay and clay in the lower 7 inches.

Available water capacity is high. Permeability is moderate in the upper part of the soil and moderately slow in the lower part. Runoff is medium. Natural fertility is high, and organic matter content is moderate. Reaction ranges from neutral to strongly acid in the upper part of the soil and from strongly acid to mildly alkaline in the lower part. This soil is easy to till. The root zone is deep. The lower part of the subsoil has a moderate shrink-swell potential.

Included with this soil in mapping are small areas of Nicholson and Lowell soils. Also included are some soils that have a slightly redder subsoil than this Shelbyville soil and a few small areas where the depth to rock is less than 5 feet.

Most of this Shelbyville soil is cleared for cultivated crops, hay, and pasture. It is suited to all crops commonly grown in the area, such as corn, tobacco, and small grains. Crops respond well to fertilizer and lime. The erosion hazard is severe; some measures for controlling erosion are needed if cultivated crops are grown. Contour tillage, stripcropping, minimum tillage, return of crop residue to the soil, use of cover crops, and inclusion of grasses and legumes in the cropping system help to control erosion and maintain organic matter content.

This soil is well suited to alfalfa and other hay and pasture plants commonly grown in the area. If properly managed, it produces high yields. Plants selected for pasture and hay should produce adequate forage and provide satisfactory ground cover. The desired species should be maintained through frequent renovation of pasture. Application of lime and fertilizer, maintenance of proper stocking rates, use of rotational grazing, and control of undesirable vegetation are needed.

Although most areas are cleared, this soil is well suited to eastern white pine, shortleaf pine, yellow-poplar, black walnut, and white ash. Plant competition is a management concern.

This soil is suited to most urban uses. Steepness of slope, moderate shrink-swell potential, and moderately slow permeability are the main limitations.

This soil is in capability subclass IIIe and woodland group 2o.

WoB—Woolper silty clay loam, 2 to 6 percent slopes. This deep, well drained soil is on alluvial fans and foot slopes. Slopes are smooth or slightly convex. Individual areas are long and narrow and range from 3 to 12 acres.

Typically, the surface layer is dark brown silty clay loam about 8 inches thick. The subsoil extends to a depth of 50 inches. It is dark brown silty clay loam in the upper 10 inches and brown silty clay in the lower 32 inches. The substratum, to a depth of 72 inches or more, is yellowish brown silty clay mottled with grayish brown.

Available water capacity is high, and permeability is moderately slow to slow. Runoff is medium. Natural fertility is medium, and organic matter content is high. Reaction ranges from slightly acid to mildly alkaline. This soil is somewhat difficult to till. The root zone is deep. The clayey subsoil has a moderate shrink-swell potential.

Included with this soil in mapping are small areas of Elk and Nolin soils and small areas of a moderately well drained soil. Also included are some soils that have less clay throughout than is typical for Woolper soils and some areas of soils that are steeper than 6 percent.

Most of this Woolper soil is in row crops or hay. It is suited to the crops grown in the area, such as corn, soybeans, tobacco, and small grains. Crops respond well to fertilizer and lime. The erosion hazard is moderate; some measures for controlling erosion are needed if cultivated crops are grown. Contour tillage, stripcropping, minimum tillage, return of crop residue to the soil, use of cover crops, and inclusion of grasses and legumes in the cropping system help to control erosion and maintain organic matter content.

This soil is suited to the pasture and hay plants commonly grown in the area. If properly managed, it produces high yields. Plants selected for pasture and hay should produce adequate forage and provide satisfactory ground cover. The desired species should be maintained through frequent renovation of pasture. Application of lime and fertilizer, maintenance of proper stocking rates, use of rotational grazing, and control of undesirable vegetation are needed.

Although most areas are cleared, this soil is well suited to black walnut, yellow-poplar, and eastern white pine. Equipment limitation is a management concern because of the clayey texture. Plant competition is also a concern in management.

This soil is suited to most urban uses. The clayey texture, moderately slow permeability, and moderate shrink-swell potential are the main limitations.

This soil is in capability subclass IIe and woodland group 2c.

WpF—Woolper-Fairmount complex, 30 to 65 percent slopes. This map unit consists of small areas of Woolper and Fairmount soils that could not be mapped separately at the scale selected for mapping. These are well drained, deep to shallow soils on short steep slopes near larger creeks. Areas are long and narrow and range from 8 to 30 acres.

The Woolper soil makes up about 55 percent of the map unit. It occurs on the lower two-thirds of the slope. Typically, the surface layer is dark brown silty clay loam about 5 inches thick. The subsoil extends to a depth of 60 inches or more. It is dark brown silty clay loam in the upper 7 inches and brown and yellowish brown silty clay in the lower 48 inches.

The Woolper soil is medium in natural fertility and high in organic matter content. It is slightly acid or mildly

alkaline. Permeability is moderately slow to slow, and available water capacity is high. The root zone is deep. The clayey subsoil has a moderate shrink-swell potential.

The Fairmount soil makes up about 30 percent of the map unit. It occurs on the steeper third of the slope. Typically, the surface layer is dark brown, flaggy silty clay loam about 14 inches thick. The subsoil, extending to a depth of 18 inches, is dark yellowish brown flaggy silty clay. Hard limestone bedrock is at a depth of 18 inches.

The Fairmount soil is medium in natural fertility and organic matter content. Reaction is neutral or moderately alkaline. Permeability is slow or moderately slow, and available water capacity is low. The root zone extends to bedrock at a depth of 10 to 20 inches. The shrink-swell potential is moderate.

Included with these soils in mapping are small areas of Faywood, Eden, and Nolin soils, and small areas of rock outcrops and rock escarpments. Also included are small areas of a shallow soil that has a lighter colored surface layer than the Fairmount soil and areas of soils, on the lower two thirds of the slope, that have a flaggy surface layer.

These Woolper and Fairmount soils are poorly suited to farming and urban uses. The steep slope and clayey subsoil limit their use mainly to woodland and wildlife habitat. Some of the lower slopes of the Woolper soil are used for pasture. The steep slopes and flagstones on the surface limit the use of modern machinery, and stands of pasture grasses are difficult to establish and maintain.

These soils are suited to trees. The Woolper soil is well suited to black walnut, yellow-poplar, and eastern white pine. The Fairmount soil is suited to eastern redcedar and Virginia pine. The erosion hazard and the equipment limitation are management concerns because of the steep slopes and the clayey subsoil. Plant competition and rate of seedling mortality are also concerns in management.

These soils are in capability subclass VIIe. The Woolper soil is in woodland group 2c, and the Fairmount soil is in woodland group 4d.

Use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil (*8*).

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and pasture

Larry E. Crews, agronomist, Soil Conservation Service, assisted in preparing this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Soil maps for detailed planning." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

More than 76,000 acres were used for crops in Shelby County in 1976. This included land was in tobacco, soybeans, small grains, and all hay crops. In 1969 about 62,000 acres were in crops. The increased row crop acreage is mainly in corn and soybeans.

The soils in Shelby County generally have good potential for row crops. Most of the row crops are grown on uplands because of the limited acreage on bottom land and terraces. The broader ridges and more level areas are suited for grain production. Deep, well drained soils, such as Shelbyville and Lowell, are preferred for tobacco and alfalfa. The more sloping Lowell, Faywood, and Eden soils are commonly used for hay and pasture.

Some principles of management are general enough to apply to all the soils in the survey area, though individual soils or groups of soils require different kinds or

degrees of management. These general principles of management for crops and pasture are discussed in the following paragraphs.

Cropland

The management systems needed for cropland are those that protect or improve the soil, reduce erosion to tolerable levels, and minimize water pollution caused by runoff carrying plant nutrients, soil particles, and plant residues.

Soil fertility ranges from medium to high in most of the soils in Shelby County. Crops respond to the addition of lime or fertilizer, or both. The amounts of lime and fertilizer to be applied depend on the natural fertility and pH, on past cropping and management, on the needs of the crop, and on the yield level desired. Additions of lime and fertilizer on all soils should be based on the results of soil tests. The Kentucky Cooperative Extension Service provides assistance in determining the amounts of fertilizer and lime to apply.

Soil tilth and crop residue management are important factors in the germination of seeds, the inflitration of water into the soil, and the maintenance of organic matter content. Most uneroded soils of the survey area have a silt loam surface layer that is medium in organic matter content and has good workability. Some of the eroded soils on sloping land have lost most of this original surface layer and are difficult to till because of the high content of clay in the present surface layer. Minimum tillage—reducing the number of cultural operations in producing a crop—helps maintain soil structure, reduce soil compaction and the formation of tillage pans, and improve soil aeration, permeability, and tilth.

Crop residue management involves using plant residues to protect cultivated fields during periods of critical erosion to conserve moisture, increase infiltration, reduce soil losses, and improve soil tilth. To be effective, enough crop residue should be distributed over the soil surface to control erosion.

Soil erosion is the most critical soil-related cropland management problem in the survey area. It reduces productivity as the surface layer is lost and part of the subsoil is incorporated into the plow layer. It reduces the rooting depth in soils that have a limiting layer in or below the subsoil, such as a fragipan in Nicholson soils or bedrock in Faywood soils. Erosion also removes plant nutrients and results in sedimentation and pollution of streams.

The 1970 Conservation Needs Inventory (*5*) indicated that only about 25 percent of the cropland in Shelby County was adequately treated. Treatment needs include stripcropping, terraces and diversions, permanent cover, pasture rotation with cultivated crops, contouring, and the use of crop residues and annual cover. Most of the cropland in the county is in capability class I, II, or III. Class I soils consist of nearly level land that has few limitations when used for cropland. Class II and III soils consist of mostly sloping land that needs erosion control to effectively reduce soil and water losses. A small acreage of nearly level soils that need artificial drainage to remove excess water is also in class II or III.

Pasture and hayland

The 1970 Conservation Needs Inventory (*5*) indicated that approximately one-fourth of the pasture and hayland in Shelby County was adequately treated. More than one-third of the pasture and hayland needed reestablishment, and a sizable acreage needed improvement, brush control, and protection from overgrazing. Other management concerns are selecting adapted forage plants, maintaining or improving soil fertility, rotating grazing, managing brush, and controlling weeds and insects.

The local office of the Soil Conservation Service can assist in planning soil management for crops and pasture.

Yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

Land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils

are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes.

In the capability system, as used in this survey area, soils are generally grouped at two levels: capability class and subclass (*11*). These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have slight limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is shown in table 6. The capability classification of each map unit is given in the section "Soil maps for detailed planning."

Woodland management and productivity

Charles A. Foster, staff forester, Soil Conservation Service, helped prepare this section.

This section describes the woodlands in Shelby County. It also explains woodland grouping of soils and provides, in table 7, information about the management of the county's soils for woodland.

Nearly all of Shelby County was covered by forests at the time of settlement. The Outer Bluegrass soils were derived mostly from limestone and calcareous shales and supported a hardwood forest of white oak, northern red oak, black walnut, white ash, yellow-poplar, and chestnut. The soils of the Hills of the Bluegrass were derived from interbedded calcareous shales, limestone, and siltstone. On the steep slopes of this section was a forest of fair to low quality hardwoods such as hickory, beech, sugar maple, and elm.

With the increasing use of land for agricultural production, the woodlands were gradually cleared. At present, approximately 18 percent of Shelby County, or 44,900 acres, remains in woodlands (*6*). The remaining woodlands are primarily on the steep slopes of the Hills of the Bluegrass, in farm woodlots, and on Jeptha Knob. Practically all of this acreage is in private ownership.

Two major forest types occur in Shelby County. The central mixed hardwood forest comprises the largest woodland area, primarily in the eastern part of the county. Major species include white oak, northern red oak, sugar maple, white ash, and black walnut. Understory species are hickory, dogwood, eastern redcedar, and sassafras. Ground vegetation consists of Smilax, wild grape, and grasses. Disturbed areas are generally covered by eastern redcedar, black locust, and multiflora rose. The central mixed hardwood forest type occurs on Lowell soils on narrow ridgetops and on steep Eden soils on side slopes.

The oak-hickory forest occurs in the Outer Bluegrass region and consists of northern red oak, scarlet oak, hickory, and ash. Understory species include hickory, sugar maple, dogwood, redbud, elm, and ash. Ground vegetation is generally wild grape, mayapple, Smilax, and poison ivy. The oak-hickory forest type occurs along steep streambanks of the Woolper-Fairmount complex; on Lowell, Faywood, and Beasley soils; and on Jeptha Knob.

Due to lack of management, overgrazing, and improper harvesting methods, only a small percentage of the woodland in Shelby County is stocked with merchantable or potentially merchantable timber. To increase productivity of woodlands, management practices should improve the quality and quantity of desirable species. Soil characteristics such as available water capacity, rooting depth, texture, drainage, and aeration influence tree

growth and type of management. Slope and aspect also influence tree growth.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *plant competition* indicate the degree to which undesirable plants are expected to invade where there are openings in the tree canopy. The invading plants compete with native plants or planted seedlings. A rating of *slight* indicates little or no competition from other plants; *moderate* indicates that plant competition is expected to hinder the development of a fully stocked stand of desirable trees; *severe* indicates that plant competition is expected to prevent the establishment of a desirable stand unless the site is intensively prepared, weeded, or otherwise managed to control undesirable plants.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* (*4*). This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suited to the soils and to commercial wood production.

Recreation

The soils of the survey area are rated in table 8 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 8, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 8 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 11 and interpretations for dwellings without basements and for local roads and streets in table 10.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no

stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife habitat

About 37 species of mammals, 38 species of terrestrial reptiles and amphibians, and 109 species of breeding birds live in Shelby County. Many of the more than 200 other kinds of birds that visit Kentucky each year pass through the county.

The most important game animals in Shelby County are gray squirrel, fox squirrel, raccoon, mink, muskrat, white-tailed deer, cottontail rabbit, bobwhite quail, and mourning dove. Although there is much overlap in the types of habitat required by these animals, the gray squirrel, fox squirrel, and white-tailed deer are usually classified as woodland wildlife; the cottontail rabbit, bobwhite quail, and mourning dove, as openland wildlife; and the raccon, mink, muskrat, and ducks, which spend most of their time in or about water, as wetland wildlife. Such nongame birds as green heron and kingfisher are also considered wetland wildlife.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants (*3*).

In table 9, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife (*15*). This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hard-

wood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants furnish browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, saltgrass, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

Habitats for various kinds of wildlife are described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, deer, and bear.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Engineering

Richard L. Quiggins, area engineer, Soil Conservation Service, assisted in preparing this section.

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building site development

Table 10 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary facilities

Table 11 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 11 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many

local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 11 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 11 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction materials

Table 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill, topsoil, sand, and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10,

a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are used in great quantities in many kinds of construction. The ratings in table 12 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Descriptions of grain size, kinds of minerals, reaction, and stratification are given in the soil series descriptions and in table 14.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water management

Table 13 gives information on the soil properties and site features that affect water management. This table also gives for each soil the restrictive features that affect pond reservoir areas; embankments, dikes, and levees; drainage, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface

water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas (*12*). Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given. The results of physical and chemical analyses of one soil are given.

Engineering properties and classification

Table 14 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and chemical properties

Table 15 shows estimates of some characteristics and features that affect soil behavior. These estimates are

given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability (*9*) is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Soil and water features

Table 16 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes is not considered flooding.

Table 16 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that

flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 16.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An artesian water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either rippable or hard. Rippable rock is likely to be sufficiently soft or fractured that excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Physical and chemical analyses of selected soils

The results of physical analysis of Shelbyville silt loam are given in table 17 and the results of chemical analysis in table 18. The data are for a soil sampled at a carefully selected site. The pedon is typical of the Shelbyville series and is described in the section "Soil series and morphology." Soil samples were analyzed by the Kentucky Agricultural Experiment Station.

Most determinations, except those for grain-size analysis and bulk density, were made on soil material smaller than 2 millimeters in diameter. Measurements reported as percent or quantity of unit weight were calculated on an oven-dry basis. The methods used in obtaining the data are indicated in the list that follows. The codes in parentheses refer to published methods (*13*).

Sand—(0.05-2.0 mm fraction) weight percentages of materials less than 2 mm (3A1).

Silt—(0.002-0.05 mm fraction) by difference, weight percentages of all materials less than 2 mm (3A1).

Clay—(fraction less than 0.002 mm) pipette extraction, weight percentages of materials less than 2 mm (3A1).

Coarse fragments—(2-76 mm fraction) weight estimates of the percentages of all materials less than 75 mm (3B1).

Organic carbon—dichromate, ferric sulfate titration (6A1a). Organic carbon multiplied by 1.72 factor equals percentage of organic matter.

Reaction (pH)—1:1 water dilution (8C1a).

Reaction (pH)—potassium chloride (8C1c).

Extractable cations—ammonium acetate pH 7.0, uncorrected; calcium (6N2), magnesium (602), sodium (6P2), potassium (6Q2).

Total extractable bases (5B1a).

Cation-exchange capacity—ammonium acetate, pH 7.0 (5A1a).

Extractable acidity—barium chloride-triethanolamine I (6H1a).
Cation-exchange capacity—sum of cations (5A3a).
Exchangeable acidity (H+ Al)—method of Yuan procedure 67-3.52, part 2, Methods of Analysis, ASA, 1965.
Base saturation—ammonium acetate, pH 7.0 (5C1).
Base saturation—sum of cations, TEA, pH 8.2 (5C3).
Calcium carbonate equivalent—procedure (236b) USDA Handbook 60, USDA Salinity Laboratory 1954 (6N7).
Available phosphorus—procedure (6S6) Ky. Agri. Expt. Sta.
Field sampling—site selection (1A1).
Field sampling—soil sampling (1A2).
Laboratory preparation—standard (air dry) material (1B1).
Particles less than specified size or greater than 2mm (2A2).
Particles less than 2mm (2A1).
Data sheet symbols (2B).
Particles greater than 2 mm by field or laboratory weighing (3B1a).

Classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*14*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 19, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Alfisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udalf (*Ud*, meaning udic moisture regime, plus *alf*, from Alfisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludalfs (*Hapl*, meaning minimal horizonation, plus *udalf*, the suborder of the Alfisols that has a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine, mixed, mesic Typic Hapludalfs.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil series and morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*10*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*14*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Soil maps for detailed planning."

Beasley series

The Beasley series consists of deep, well drained soils that have moderately slow permeability. These soils formed in the residuum of soft, calcareous shale and limestone. They are on ridgetops and side slopes and in karst areas. Slopes range from 2 to 30 percent but are dominantly 2 to 12 percent.

Beasley soils are associated with Crider, Brassfield, and Nicholson soils. They contain more clay in the upper

part of the B horizon than Crider soils and are not as deep. Beasley soils are deeper to bedrock than Brassfield soils and lack the fragipan of Nicholson soils.

Typical pedon of Beasley silt loam, 2 to 6 percent slopes, about 15 miles northwest of Shelbyville, 1.5 miles south of junction of Long Run Road and Kentucky Highway 362, 800 feet west of Long Run Road, and 1,000 feet south of farm lane:

Ap—0 to 5 inches; brown (10YR 5/3) silt loam; weak fine granular and moderate fine subangular blocky structure; friable; common very fine roots; neutral; abrupt smooth boundary.

B21t—5 to 14 inches; strong brown (7.5YR 5/6) silty clay; moderate fine angular and subangular blocky structure; firm, slightly sticky; few very fine roots; few irregular pores; few angular chert fragments; common dark coatings; few channels of brown silt loam; neutral; gradual wavy boundary.

B22t—14 to 23 inches; strong brown (7.5YR 5/6) clay; few medium faint light yellowish brown (10YR 6/4) mottles; moderate fine and very fine angular blocky structure; firm, sticky; few fine roots; few fine irregular pores; thick continuous clay films; slightly acid; gradual wavy boundary.

B3—23 to 39 inches; mottled brown (7.5YR 5/4), pale yellow (2.5Y 7/4), and pale olive (5Y 6/3) clay; moderate medium angular and subangular blocky structure; firm, sticky; few very fine roots; few very fine tubular and irregular pores; thin patchy clay films; few dark coatings; 5 percent olive gray shale fragments; neutral; clear smooth boundary

C—39 to 43 inches; mottled dark yellowish brown (10YR 4/4), light brownish gray (2.5Y 6/2), and yellowish brown (10YR 5/8) silty clay; massive; firm, sticky; few carbonate nodules; moderately alkaline; abrupt smooth boundary.

Cr—43 to 50 inches; pale yellow, soft interbedded calcareous shale, siltstone, and limestone.

Solum thickness ranges from 24 to 40 inches. Depth to soft, calcareous rock is 40 inches or more. The content of coarse fragments ranges from 0 to 10 percent in the solum and from 0 to 35 percent in the C horizon. Reaction ranges from very strongly acid to neutral in the upper part of the solum and from neutral to moderately alkaline in the B3 and C horizons. The B3 and C horizons are calcareous.

The Ap horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 through 4. Texture is silt loam or silty clay loam.

The B2 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 through 8. Some pedons have common mottles in shades of brown, yellow, or olive. Texture is clay or silty clay.

The B3 and C horizons have hue of 10YR, 7.5YR, 5Y, or 2.5Y, value of 4 through 6, and chroma of 2 through 8. Some pedons lack a dominant color and are mottled in shades of yellow, olive, gray, or brown. Texture is clay or silty clay.

Boonesboro series

The Boonesboro series consists of moderately deep, well drained soils that have moderate permeability. These soils have a thick dark surface layer. They formed in local alluvium washed from upland soils of limestone, siltstone, and shale origin. These nearly level soils are on flood plains in narrow valleys.

Boonesboro soils are assoicated with Nolin, Elk, Woolper, and Newark soils. They are shallower to rock than the associated soils, and are better drained than Newark soils. Woolper and Elk soils have an argillic horizon.

Typical pedon of Boonesboro silt loam, about 3 miles west of Finchville, 800 feet south of Kentucky Highway 148 and 20 feet north of Plum Creek:

Ap—0 to 10 inches; dark brown (10YR 3/3) silt loam; moderate fine and medium granular structure; very friable; few very fine roots; neutral; abrupt smooth boundary.

B—10 to 20 inches; brown (10YR 4/3) silt loam; weak medium subangular blocky structure; very friable; few fine roots; neutral; clear smooth boundary.

C—20 to 30 inches; brown (10YR 4/3) silt loam with few thin bands of fine sandy loam; 2 percent coarse fragments of limestone; neutral; abrupt smooth boundary.

R—30 inches; hard limestone.

Solum thickness and depth to limestone bedrock ranges from 20 to 40 inches. The content of coarse fragments ranges from 0 to 10 percent in the solum and from 0 to 25 percent in the C horizon. Reaction ranges from slightly acid to mildly alkaline.

The A or Ap horizon has hue of 10YR or 7.5YR, value of 3, and chroma of 2 or 3. Texture is silt loam or silty clay loam.

The B horizon has hue of 10YR or 7.5YR, value of 4, and chroma of 2 through 4. Texture is silt loam or silty clay loam.

The C horizon, if present, is silt loam or silty clay loam and their gravelly analogues.

The Boonesboro soils in this survey area are a taxajunct to the Boonesboro series because they have a thinner A horizon and fewer coarse fragments in the lower part of the solum than is defined for the Boonesboro series.

Brassfield series

The Brassfield series consists of moderately deep, well drained soils that have moderate permeability. These soils formed in the residuum of interbedded greenish gray limestone and calcareous siltstone and

sandstone. Brassfield soils are on steep side slopes. Slopes range from 20 to 30 percent.

Brassfield soils are associated with Beasley and Fairmount soils. Beasley soils have a clayey argillic horizon and are deeper to rock. Fairmount soils are less than 20 inches deep to hard limestone.

Typical pedon of Brassfield silt loam, in an area of Brassfield-Beasley complex, 20 to 30 percent slopes, located in a field about 15 miles northwest of Shelbyville, 1/2 mile northwest of junction of Kentucky Highway 362 and Long Run Road and 500 feet south of Floyds Fork:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure and moderate fine and medium subangular blocky; friable; common very fine roots; few fine pores; 8 percent angular siltstone and sandstone fragments; neutral; clear smooth boundary.

B2—8 to 24 inches; brownish yellow (10YR 6/6) loam; few fine mottles of brownish yellow (10YR 6/8) and light yellowish brown (2.5Y 6/4); weak medium and fine subangular blocky structure; friable; few fine roots; 10 percent soft sandstone fragments; moderately alkaline; calcareous; gradual smooth boundary.

Cr—24 to 36 inches; soft pale olive (5Y 6/3) siltstone and shale that crushes by hand to silt loam; distinct mottles of light yellowish brown (2.5Y 6/4) and olive (5Y 5/3); relic platy structure; firm; common white carbonate coatings; moderately alkaline.

Solum thickness ranges from 10 to 30 inches. Depth to rock is 20 to 40 inches. The content of coarse fragments ranges from 8 to 30 percent. Reaction ranges from neutral to mildly alkaline in the A horizon. The B and C horizons are calcareous.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or 2.

The B horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 through 6. It is loam or silt loam. Low chroma colors, where present, are inherited from the parent rock.

The C horizon has hue of 5Y, value of 5 or 6, and chroma of 1 through 3 with light yellowish brown and light olive brown mottles.

Crider series

The Crider series consists of deep, well drained soils that have moderate permeability. These soils formed in loess and the underlying residuum from limestone. Crider soils are on ridgetops, side slopes, and karst areas. Slopes range from 2 to 6 percent.

Crider soils are associated with Beasley and Nicholson soils. Beasley soils are more clayey in the upper part of the solum and are shallower to bedrock than Crider soils. Nicholson soils have a fragipan and are not as well drained.

Typical pedon of Crider silt loam, 2 to 6 percent slopes, about 15 miles west of Shelbyville, 1.2 miles west of junction of Kentucky Highway 362 and Long Run Road, 0.5 mile south of Floyds Fork and 100 feet west of farm house:

Ap—0 to 10 inches; brown (10YR 4/3) silt loam; weak fine granular structure; very friable; common very fine roots; moderately alkaline; abrupt smooth boundary.

B1—10 to 22 inches; brown (7.5YR 4/4) silt loam; moderate medium and fine subangular blocky structure; friable; few very fine roots; few fine continuous pores; few thin discontinuous clay films; mildly alkaline; gradual smooth boundary.

B21t—22 to 35 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium and fine subangular blocky structure; friable; few very fine roots; few fine continuous pores; thin continuous clay films; slightly acid; clear smooth boundary.

IIB22t—35 to 48 inches; yellowish red (5YR 4/6) silty clay loam; moderate medium and fine subangular and angular blocky structure; friable; continuous clay films; common iron and manganese nodules and coatings; strongly acid; gradual smooth boundary.

IIB23t—48 to 69 inches; red (2.5YR 4/6) silty clay; few medium faint yellowish red (5YR 4/6) mottles; moderate fine and medium subangular and angular blocky structure; firm, sticky when wet; continuous clay films; common manganese and iron nodules and dark coatings; few small chert fragments; strongly acid; gradual smooth boundary.

IIB24t—69 to 84 inches; red (2.5YR 4/6) clay; few medium faint strong brown (7.5YR 5/6) and yellowish red (5YR 4/6) mottles; moderate fine angular and subangular blocky structure; firm, sticky when wet; continuous clay films; many dark coatings; 3 percent small chert fragments; moderately alkaline.

Solum thickness is more than 60 inches. Depth to rock ranges from 5 to 10 feet. The content of coarse fragments ranges from 0 to 15 percent in the IIB2t horizon. Reaction is strongly acid to slightly acid in the upper part of the solum, except in limed areas, but ranges to moderately alkaline near bedrock. Thickness of the loess is from 20 to 40 inches.

The Ap horizon has hue of 7.5YR or 10YR, value of 4, and chroma of 2 through 4.

The B1 horizon has hue of 10YR or 7.5YR, and value and chroma of 4.

The B2t horizon has hue of 10YR or 7.5YR in the upper part and 7.5YR or 5YR in the lower part, value of 4 or 5, and chroma of 4 through 6. Texture is silt loam or silty clay loam.

The IIB2t horizon has hue of 5YR and 2.5YR, value of 3 to 5, and chroma of 4 or 6. Some pedons are mottled in shades of brown and yellow. Texture is silty clay loam, silty clay, or clay.

Eden series

The Eden series consists of moderately deep, well drained soils that have slow permeability. These soils formed in the residuum of shale, siltstone, and limestone and are sloping on ridgetops and steep on side slopes. Slopes range from 6 to 30 percent but are dominantly 15 to 30 percent.

Eden soils are associated with Lowell and Nicholson soils on ridgetops and Faywood, Fairmount, and Woolper soils on side slopes. Eden soils have a thinner solum than Lowell, Woolper, and Nicholson soils and lack the fragipan of the Nicholson soils. They are deeper to hard rock than Fairmount and Faywood soils.

Typical pedon of Eden flaggy silty clay, 20 to 30 percent slopes, severely eroded, 10 miles east of Shelbyville, 2 miles west of Franklin County line, and 800 feet south of U.S. Highway 60 in a pasture:

Ap—0 to 6 inches; olive brown (2.5Y 4/4) flaggy silty clay; moderate fine granular and moderate medium subangular blocky structure; friable; many very fine roots; 15 percent limestone flagstones 6 to 15 inches across; neutral; clear smooth boundary.

B2t—6 to 19 inches; light olive brown (2.5Y 5/4) flaggy silty clay; strong medium subangular blocky structure parting to strong medium and fine angular blocky; firm; common very fine roots; few continuous irregular pores; continuous clay films; 5 percent shale fragments 1 to 3 inches across and 15 percent limestone flagstones 6 to 12 inches across; neutral; gradual wavy boundary.

B3—19 to 25 inches; light olive brown (2.5Y 5/4) flaggy silty clay; few fine faint yellowish brown (10YR 5/6) and pale olive (5Y 6/3) mottles; few very fine roots; 5 percent soft shale fragments and 15 percent limestone flagstones 3 to 15 inches across; mildly alkaline; abrupt smooth boundary.

Cr—25 to 50 inches; soft interbedded calcareous shale with 25 percent thin bedded limestone.

Solum thickness ranges from 14 to 30 inches. Depth to a paralithic contact ranges from 20 to 40 inches. The content of coarse fragments ranges from 0 to 20 percent in the A horizon, 10 to 35 percent in the B horizon, and 25 to 75 percent in the C horizon. Reaction ranges from strongly acid to moderately alkaline in the solum and from mildly alkaline to moderately alkaline in the C horizon.

The Ap horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. Texture ranges from silt loam to silty clay and their flaggy analogues.

The B horizon has hue of 10YR, 2.5Y, or 5Y; value of 4 or 5; and chroma of 3 through 6. Texture is silty clay or clay with flaggy or channery analogues.

The C horizon, where present, has hue of 2.5Y or 5Y, value of 4 through 6, and chroma of 1 through 4. Texture is silty clay or clay with flaggy, very flaggy, or channery analogues.

The Eden soils in the Lowell-Eden association, steep, are taxadjuncts to the series because they do not have a paralithic contact within a depth of 40 inches. The bedrock has been shattered by a geologic uplift.

Elk series

The Elk series consists of deep, well drained soils that have moderate permeability. These soils formed in mixed alluvium on stream terraces. Slopes range from 0 to 12 percent.

Elk soils are associated with Nolin and Otwell soils. The Elk soils have an argillic horizon, which Nolin soils lack, and are better drained and lack the fragipan of Otwell soils.

Typical pedon of Elk silt loam, 2 to 6 percent slopes, 5 miles south of Shelbyville 1,400 feet south of junction of Bullskin Creek and Clear Creek in a pasture:

Ap—0 to 8 inches; brown (10YR 4/3) silt loam; moderate fine and very fine granular structure; very friable; few very fine roots; neutral; clear smooth boundary.

B1—8 to 14 inches; brown (7.5YR 4/4) silt loam; weak medium and fine subangular blocky structure; friable; few very fine roots; few very fine tubular pores; few fine dark nodules; slightly acid; gradual smooth boundary.

B21t—14 to 29 inches; brown (7.5YR 4/4) silty clay loam; moderate medium and fine subangular blocky structure; friable; few very fine roots; few very fine tubular pores; few clay films; few dark nodules; slightly acid; gradual smooth boundary.

B22—29 to 42 inches; brown (7.5YR 4/4) silty clay loam; moderate medium and fine subangular blocky and angular blocky structure; friable; few fine tubular pores; continuous clay films; few very fine dark nodules; slightly acid; gradual wavy boundary.

B3—42 to 56 inches; brown (7.5YR 4/4) silty clay loam; few fine faint strong brown (7.5YR 5/6) mottles; moderate fine subangular blocky structure; friable; few thin clay films; few very fine dark nodules; slightly acid; clear wavy boundary.

C—56 to 65 inches; brown (7.5YR 4/4) silty clay loam; massive; friable; slightly acid.

Solum thickness ranges from 40 to 60 inches. Depth to bedrock ranges from 6 to 20 feet or more. Coarse fragments range from 0 to 5 percent in the solum and from 0 to 20 percent in the C horizon. Reaction ranges from strongly acid to slightly acid except in limed areas.

The Ap horizon has hue of 10YR and 7.5YR, value of 4, and chroma of 2 through 4.

The B horizon has hue of 10YR and 7.5YR, value of 4 or 5, and chroma of 4 through 6. Texture of the B horizon is silt loam or silty clay loam. The B3 and C horizons may have mottles or silt coatings with colors of brown or gray.

The C horizon has color similar to that of the B horizon.

Fairmount series

The Fairmount series consists of shallow, well drained, slowly permeable soils that formed in limestone residuum. These soils are very steep on hillsides.

Fairmount soils are associated with Woolper, Eden, and Faywood soils on side slopes. Woolper soils occur below Fairmount soils and are deeper to bedrock. Eden and Faywood soils are moderately deep and occur on moderately steep or steep side slopes.

Typical pedon of Fairmount flaggy silty clay loam, in an area of Woolper-Fairmount complex, 30 to 65 percent slopes, 6 miles south of Shelbyville, 0.25 mile west of the end of Popes Corner Road, and 1,800 feet southeast of confluence of Bullskin and Clear Creeks:

Ap—0 to 7 inches; dark brown (10YR 3/3) flaggy silty clay loam; moderate medium granular structure; very friable; many very fine roots; 20 percent thin limestone fragments 6 to 12 inches long; neutral; clear smooth boundary.

A12—7 to 14 inches; dark brown (10YR 3/3) flaggy silty clay loam; moderate fine granular and moderate fine angular blocky structure; friable; common fine roots; 25 percent limestone fragments 4 to 10 inches long; neutral; clear smooth boundary.

B2—14 to 18 inches; dark yellowish brown (10YR 4/4) flaggy silty clay; moderate medium and fine angular blocky structure; firm, sticky; few fine roots; 30 percent limestone fragments 3 to 10 inches long; mildly alkaline; abrupt smooth boundary.

R—18 inches; hard limestone.

Solum thickness and depth to bedrock ranges from 10 to 20 inches. Reaction ranges from neutral to moderately alkaline. Limestone fragments range from 15 to 35 percent.

The Ap or A horizon has hue of 10YR and value and chroma of 2 or 3. Texture is flaggy silty clay loam or flaggy silty clay.

The B2 horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. It consists of flaggy analogues of silty clay loam, silty clay, or clay.

Faywood series

The Faywood series consists of moderately deep, well drained soils that have moderately slow to slow permeability. These soils formed in the residuum of interbedded limestone and shale. Faywood soils are on ridgetops, side slopes, and karst areas. Slopes range from 6 to 20 percent but are dominantly 12 to 20 percent.

Faywood soils are associated with Lowell, Fairmount, and Eden soils. They are deeper to bedrock than Fairmount soils and more shallow to hard limestone than Lowell and Eden soils.

Typical pedon of Faywood silt loam, 6 to 12 percent slopes, 4 miles northwest of Shelbyville, 0.5 mile northeast of junction of Hebron Road and Harrington Mill Pike, and 1,050 feet east of Fox Run Creek:

Ap—0 to 6 inches; brown (10YR 4/3) silt loam; moderate medium granular and moderate fine subangular blocky structure; friable; many fine roots; neutral; clear smooth boundary.

B21t—6 to 17 inches; strong brown (7.5YR 5/6) silty clay; moderate medium subangular blocky structure parting to moderate fine angular blocky; firm, sticky and plastic; common very fine roots; few very fine tubular pores; thick continuous clay films; few fine dark nodules; slightly acid; clear smooth boundary.

B22t—17 to 26 inches; yellowish brown (10YR 5/4) silty clay; few fine distinct pale olive (5Y 6/3) mottles; moderate fine and very fine angular blocky structure and moderate medium subangular blocky; firm, plastic and sticky; few very fine roots; continuous clay films; common dark coatings; neutral; gradual smooth boundary.

C—26 to 30 inches; light olive brown (2.5Y 5/4) silty clay; few fine distinct olive (5Y 5/3) and yellowish brown (10YR 5/6) mottles; massive; plastic and sticky; 10 percent carbonate nodules and limestone fragments; mildly alkaline; abrupt irregular boundary.

R—30 inches; limestone berdrock.

Solum thickness and depth to bedrock is 20 to 40 inches. Reaction ranges from strongly acid to neutral in the upper part of the solum and from slightly acid to mildly alkaline in the lower solum and C horizon. Limestone and shale fragments range from 0 to 10 percent in the solum and up to 25 percent in the C horizon.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3.

The B2t horizon has hue of 7.5YR, 10YR, or 2.5Y; value of 4 or 5; and chroma or 4 through 6. The lower part is commonly mottled in shades of brown or olive. Texture is silty clay, clay, or silty clay loam.

The C horizon has hue of 10YR or 2.5Y and value and chroma of 4 through 6 and may contain brown or olive mottles with chroma of 2 or 3. Texture is silty clay or clay.

Lowell series

The Lowell series consists of deep, well drained soils that have moderately slow permeability. These soils formed in the residuum of interbedded limestone, calcareous shale, and siltstone. Lowell soils are on ridgetops, side slopes, and karst areas. Slopes range from 2 to 40 percent but are dominantly 6 to 12 percent.

Lowell soils are associated with Beasley, Faywood, Eden, Nicholson, and Shelbyville soils. They have a thicker B2 horizon than Beasley soils and are deeper to a lithic or paralithic contact than Faywood and Eden soils. They lack the fragipan of the Nicholson soils and contain more clay in the upper B2 horizon than Shelbyville soils.

Typical pedon of Lowell silt loam, 6 to 12 percent slopes, 10 miles west of Shelbyville, 0.5 mile south of Interstate Highway 64 and 200 yards west of Conner Station Road in a pasture:

Ap—0 to 6 inches; brown (10YR 4/3) silt loam; weak very fine granular structure; very friable; common very fine roots; neutral; abrupt smooth boundary.

B21—6 to 24 inches; yellowish brown (10YR 5/6) silty clay; moderate medium subangular and moderate fine angular blocky structure; firm; common very fine roots; few very fine continuous tubular pores; continuous clay films; few dark oxide nodules; slightly acid; clear wavy boundary.

B22t—24 to 43 inches; yellowish brown (10YR 5/6) clay; many fine faint pale brown (10YR 6/3) and light olive brown (2.5Y 5/4) mottles; medium and fine angular blocky structure; few very fine roots; few very fine continuous irregular pores; continuous clay films; few small dark oxide nodules; slightly acid; clear smooth boundary.

B3—43 to 50 inches; mottled light olive brown (2.5Y 5/4), olive (5Y 5/3), and yellowish brown (10YR 5/6) clay; medium and fine angular blocky structure; very firm; few clay films along cracks; common dark coatings; few carbonate coatings in lower part; 10 percent limestone fragments; mildly alkaline; abrupt smooth boundary.

R—50 inches; hard limestone bedrock.

Solum thickness ranges from 30 to 60 inches. Depth to limestone or siltstone bedrock ranges from 40 to 80 inches or more. Reaction ranges from slightly acid to very strongly acid to a depth of 30 inches, except in limed areas, and from strongly acid to mildly alkaline below 30 inches. The content of coarse fragments ranges from 0 to 5 percent in the upper part of the solum, from 0 to 15 percent in the lower part, and up to 50 percent in the C horizon.

The Ap horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 through 4. Texture is silt loam or silty clay loam.

The B1 horizon, where present, has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 through 6. Texture is silt loam, silty clay loam, or silty clay.

The B2 horizon has hue of 7.5YR, 10YR, or 2.5Y; value of 5 or 6; and chroma of 4 through 8. Some pedons have olive or gray mottles in the lower part. Texture is silty clay or clay.

The B3 horizon has hue of 10YR, 2.5Y, or 5Y; value of 5 or 6; and chroma of 3 through 6. It is mottled in shades of brown, gray, and olive. Texture is silty clay or clay.

The C horizon, where present, has color and texture similar to those of the B3 horizon.

The Lowell soils in the Lowell-Eden association are taxadjuncts because they have more coarse fragments than defined in the range for the Lowell series.

McGary series

The McGary series consists of deep, somewhat poorly drained, slowly permeable soils that formed in clayey sediments on nearly level upland depressions and stream terraces.

McGary soils are associated with Otwell soils on stream terraces and occur near Newark soils. In upland depressions, McGary soils are associated with Nicholson soils. They have more clay in the subsoil than Otwell and Nicholson soils and lack a fragipan. Newark soils do not have an argillic horizon.

Typical pedon of McGary silt loam, 4 miles south of Shelbyville, 7 miles south of junction of Kentucky Highway 53 and McMakin-McMullen Road and 400 feet west of McMakin-McMullen Road in a pasture:

Ap—0 to 7 inches; brown (10YR 5/3) silt loam; weak fine granular structure; friable; common fine roots; neutral; clear smooth boundary.

B21t—7 to 16 inches; yellowish brown (10YR 5/4) silty clay loam; common medium faint yellowish brown (10YR 5/6) and pale brown (10 YR 6/3) mottles; weak medium subangular blocky structure; friable; few fine roots; fine tubular pores; thin discontinuous clay films; slightly acid; clear wavy boundary.

B22t—16 to 20 inches; light brownish gray (10YR 6/2) silty clay; common large faint yellowish brown (10YR 5/6) and pale brown (10YR 6/3) mottles; moderate medium subangular and fine angular blocky structure; friable; few fine roots; fine tubular pores; continuous clay films; medium acid; clear smooth boundary.

B23t—20 to 45 inches; light brownish gray (10YR 6/2) silty clay; common medium distinct yellowish brown (10YR 5/8) mottles; fine and medium subangular and angular blocky structure; firm, sticky and plastic; few fine tubular and irregular pores; continuous clay films; few small dark nodules; slightly acid; gradual wavy boundary.

C—45 to 69 inches; mottled light brownish gray (10YR 6/2), brown (7.5YR 4/4), and yellowish brown (10YR 5/6) silty clay; massive; firm, sticky and plastic; few black coatings and small dark nodules; mildly alkaline; abrupt smooth boundary.

R—69 inches; hard limestone bedrock.

Solum thickness ranges from 24 to 50 inches. Depth to rock is more than 5 feet. Reaction ranges from slightly acid to strongly acid in the upper part of the solum and from medium acid to mildly alkaline in the lower part of the solum and C horizon. Thickness of the silt mantle ranges from 12 to 20 inches.

The Ap horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 or 3.

The upper part of the B horizon has hue of 10YR or 2.5Y, value of 5 or 6, and dominant chroma in the matrix or on ped faces of 3 or 4. Texture is silt loam or silty

clay loam. The lower part of the B horizon has hue of 10YR or 2.5Y, value of 4 to 6, and dominant chroma in the matrix or on ped faces of 2 or less. Mottles in the B horizon are gray, yellowish brown, and strong brown. Texture ranges from silty clay loam to silty clay.

The C horizon is mottled in hue of 7.5YR, 10YR, 2.5Y, and 5Y; value of 4 or 5; and chroma of 1 to 6. Texture is silty clay or clay and may contain thin strata of silty clay loam or silt loam.

In this survey area McGary soils are taxadjuncts because they have a silt mantle, 12 to 20 inches thick, and they lack the carbonates that are defined in the range for the McGary series.

Newark series

The Newark series consists of deep, somewhat poorly drained soils that have moderate permeability. These soils formed in mixed alluvium washed from soils formed in materials weathered from limestone, shale, and siltstone. The Newark soils are nearly level or in depressions on flood plains.

Newark soils are associated with Nolin and Elk soils. They are not so well drained as the associated soils and lack the argillic horizon of the Elk soils.

Typical pedon of Newark silt loam, 1 mile north of Finchville, 800 feet east of Kentucky Highway 55 and 900 feet southeast of bridge at Bullskin Creek:

Ap—0 to 9 inches; grayish brown (10YR 5/2) silt loam; weak fine granular structure; very friable; few very fine roots; neutral; abrupt smooth boundary.

B21—9 to 16 inches; grayish brown (2.5Y 5/2) silt loam; few fine distinct gray (5Y 5/1) mottles; weak fine subangular blocky structure; friable; few very fine roots; few very fine tubular pores; neutral; gradual smooth boundary.

B22—16 to 32 inches; grayish brown (2.5Y 5/2) silt loam; few fine distinct pale brown (10YR 6/3) and dark brown (7.5YR 4/4) mottles; weak fine subangular blocky sturcture; friable; common fine tubular pores; slightly acid; gradual smooth boundary.

C1g—32 to 50 inches; gray (5Y 5/1) silty clay loam; massive and moderate fine subangular blocky structure; friable; many soft dark brown nodules and coatings; slightly acid; clear smooth boundary.

C2g—50 to 70 inches; mottled gray (5Y 6/1), yellowish brown (10YR 5/6), and brown (10YR 5/3) silty clay loam; slightly firm and sticky; many dark brown soft oxide nodules and coatings; slightly acid.

Solum thickness ranges from 24 to 44 inches. Depth to bedrock is more than 5 feet. Content of coarse fragments is less than 5 percent in the upper 30 inches and ranges to as much as 15 percent below 30 inches. Reaction ranges from medium acid to mildly alkaline.

The Ap horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4.

The upper part of the B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 through 4. Mottles, if present, are in shades of gray or brown. The lower part of the B horizon has hue of 10YR or 2.5Y, value of 4 through 7, and chroma of 2 or less. Mottles are in shades of brown. Texture is silt loam or silty clay loam.

The C horizon has hue of 10YR, 2.5Y, or 5Y; value of 5 through 7; and chroma of 1 or 2. It contains brown mottles. Texture is silt loam or silty clay loam, and some pedons have thin layers of loam, fine sandy loam, or silty clay.

Nicholson series

The Nicholson series consists of deep, moderately well drained soils that have a slowly permeable fragipan. These soils formed in a mantle of loess underlain by the residuum of limestone. Nicholson soils are on ridgetops and side slopes. Slopes range from 2 to 12 percent but are dominantly 2 to 8 percent.

Nicholson soils are associated with Shelbyville, Lowell, Beasley, and Crider soils. Nicholson soils have a fragipan and are less well drained than the associated soils.

Typical pedon of Nicholson silt loam, 2 to 6 percent slopes, 12 miles northeast of Shelbyville, 3 miles east of Cropper, 1 mile northeast of Sixmile Creek, and 500 feet south of Radcliff-Shipman Road:

Ap—0 to 10 inches; brown (10YR 4/3) silt loam; weak fine granular structure; very friable; common very fine roots; common very fine tubular pores; slightly acid; clear smooth boundary.

B21—10 to 20 inches; strong brown (7.5YR 5/6) silty clay loam; weak medium and fine subangular blocky structure; friable; few very fine roots; common tubular pores; thin clay films; few small dark nodules; slightly acid; gradual smooth boundary.

B22t—20 to 26 inches; strong brown (7.5YR 5/6) silty clay loam; few fine distinct light yellowish brown (10YR 6/4) mottles; moderate medium and fine subangular blocky structure; friable; continuous clay films; common dark nodules and oxide coatings; slightly acid; clear smooth boundary.

Bx—26 to 37 inches; yellowish brown (10YR 5/4) silty clay loam; common medium and large distinct brown (7.5YR 4/4) and common medium light gray (10YR 7/2) mottles; moderate very coarse prismatic structure parting to moderate medium angular blocky; firm, brittle and compact; common clay films; common dark nodules and oxide coatings; medium acid; gradual smooth boundary.

IIB3—37 to 69 inches; brown (7.5YR 4/4) silty clay; common light gray (10YR 7/2) mottles and silt coatings; moderate corase blocky structure; firm; few clay films; many dark oxide coatings; slightly acid.

Solum thickness ranges from 40 to 80 inches. Depth to bedrock ranges from 60 to 100 inches or more. Depth

to the fragipan is 18 to 30 inches. Reaction ranges from very strongly acid to slightly acid through the fragipan, except in limed areas, and from strongly acid to mildly alkaline below the fragipan.

The Ap horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 through 4.

The B2 horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 through 6. Texture is silt loam or silty clay loam.

The Bx horizon has hue of 7.5YR, 10YR, or 2.5YR; value of 4 or 5; and chroma of 4 through 8 with few to many gray mottles. Texture is silt loam or silty clay loam.

The IIB and IIC horizons have hue of 7.5YR, 10YR, or 2.5Y and value and chroma of 4 to 6, and are mottled in shades of yellow, brown, and gray. Texture is silty clay or clay.

Nolin series

The Nolin series consists of deep, well drained soils that have moderate permeability. These soils formed in alluvium washed from soils derived from limestone, siltstone, and shale. The nearly level Nolin soils, on flood plains, are subject to flooding of short duration in winter and spring.

Nolin soils are associated with Newark and Boonesboro soils on flood plains and Elk soils on stream terraces. They are better drained than Newark soils, are deeper to bedrock than Boonesboro soils, and lack the argillic horizon of Elk soils.

Typical pedon of Nolin silt loam, 5 miles south of Shelbyville and 600 feet south of confluence of Bullskin Creek and Clear Creek:

Ap—0 to 11 inches; brown (10YR 4/3) silt loam; weak fine granular structure; very friable; common fine roots; neutral; abrupt smooth boundary.

B21—11 to 22 inches; brown (7.5YR 4/4) silt loam; weak fine and medium subangular blocky structure; friable; common fine roots; few very fine tubular pores; neutral; clear wavy boundary.

B22—22 to 52 inches; brown (7.5YR 4/4) silt loam; moderate medium and fine subangular blocky structure; friable; few very fine roots; few very fine pores; few thin flows in pores; slightly acid; gradual wavy boundary.

C—52 to 65 inches; dark yellowish brown (10YR 4/4) silt loam; few fine distinct dark reddish gray (5YR 4/2) mottles; massive; friable; few small dark nodules of iron and manganese; 2 percent shale and siltstone fragments; slightly acid.

Solum thickness is more than 40 inches. Depth to bedrock is 6 to 12 feet or more. Reaction ranges from medium acid to moderately alkaline.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3.

The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. Some pedons have mottles with chroma of 2 or less below 24 inches.

The C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 through 4. The C horizon is silt loam, fine sandy loam, or stratified layers of these or their gravelly analogues.

Otwell series

The Otwell series consists of deep, moderately well drained soils that have a very slowly permeable fragipan. These soils formed in mixed alluvium washed from soils derived from limestone, siltstone, and shale. Otwell soils are on foot slopes and stream terraces. Slope ranges from 2 to 6 percent.

Otwell soils are associated with Elk, Newark, and Nolin soils. They have a fragipan, which is lacking in the associated soils.

Typical pedon of Otwell silt loam, 2 to 6 percent slopes, 1.5 miles south of Finchville, 0.5 mile south of Kentucky Highway 55 and 400 feet east of Buck Creek:

Ap—0 to 8 inches; brown (10YR 4/3) silt loam; weak fine granular structure; very friable; common fine roots; neutral; clear smooth boundary.

B21t—8 to 19 inches; strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6) silty clay loam; weak medium and fine subangular blocky structure and fine angular blocky; friable; common fine roots; continuous clay films; neutral; gradual smooth boundary.

B22t—19 to 25 inches; yellowish brown (10YR 5/4) silty clay loam; few fine faint pale brown (10YR 6/3) and strong brown (7.5YR 5/6) mottles; moderate medium and fine subangular blocky structure and moderate fine angular blocky; friable; few fine roots; few very fine tubular pores; continuous clay films; slightly acid; abrupt smooth boundary.

Bx—25 to 44 inches; yellowish brown (10YR 5/4) silty clay loam; common medium faint light brownish gray (10YR 6/2) and dark yellowish brown (10YR 3/4) mottles; moderate very coarse prismatic structure parting to moderate medium angular blocky and subangular blocky; firm, brittle; few very fine roots along prism faces; few fine tubular pores; clay films; few dark coatings; strongly acid; gradual smooth boundary.

B3—44 to 51 inches; yellowish brown (10YR 5/6) silty clay loam; few medium faint light brownish gray (10YR 6/2) mottles; weak medium angular and subangular blocky structure; firm; 25 percent weakly cemented iron oxides; neutral; clear smooth boundary.

C—51 to 61 inches; brown (7.5YR 4/4) stratified silty clay loam and silty clay; common large distinct light yellowish brown (2.5Y 6/4) and brownish yellow (10YR 6/6) mottles; massive; friable; few reddish brown (5YR 4/3) weakly cemented fragments of iron; mildly alkaline; abrupt smooth boundary.

R—61 inches; limestone bedrock.

Solum thickness ranges from 40 to 60 inches or more. Depth to bedrock ranges from 5 to 10 feet or more. Depth to the fragipan ranges from 20 to 30 inches. Reaction ranges from very strongly acid through neutral.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 through 4.

The B2 horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3, 4, and 6. Texture is silt loam or silty clay loam.

The matrix colors of the Bx and B3 horizons are in hue of 7.5YR, 10YR, or 2.5Y; value of 4 through 6; and chroma of 2 through 6. Mottles are in shades of gray. Texture of the Bx horizon is silt loam or silty clay loam. The Bx horizon is firm or very firm.

The C horizon is silt loam or silty clay loam and may contain stratified layers of loam, fine sandy loam, and silty clay.

In this survey area Otwell soils are taxadjuncts because they are less acid than defined in the range for the Otwell series.

Shelbyville series

The Shelbyville series consists of deep, well drained soils that have moderate to moderately slow permeability. These soils formed in loess overlying the clayey residuum of limestone. Shelbyville soils are on ridgetops and upper slopes, and some areas are slighty karst. Slopes range from 2 to 12 percent.

Shelbyville soils are associated with Lowell, Nicholson, and Faywood soils. They have less clay in the upper B horizon than Lowell and Faywood soils and lack the fragipan of the Nicholson soils.

Typical pedon of Shelbyville silt loam, 2 to 6 percent slopes, 2 miles east of Shelbyville and 250 yards east of junction of Kentucky Highway 1871 and U.S. Highway 60 in a pasture:

Ap—0 to 9 inches; dark brown (10YR 3/3) silt loam; moderate fine and medium granular structure; very friable; many fine roots; common fine pores; neutral; abrupt smooth boundary.

B21—9 to 21 inches; brown (7.5YR 4/4) silty clay loam; moderate medium subangular blocky structure parting to weak fine subangular blocky; friable; common fine roots; common fine pores; common patchy clay films; few fine black concretions; slightly acid; clear smooth boundary.

B22—21 to 28 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure parting to moderate fine blocky; friable; few fine roots; common fine pores; many brown clay films; few fine black concretions; slightly acid; gradual smooth boundary.

B23t—28 to 38 inches; brown (7.5YR 4/4) silty clay loam; common medium faint light yellowish brown (10YR 6/4) mottles; moderate medium subangular blocky structure parting to moderate fine blocky; firm; few fine pores; many clay films; few fine black concretions; neutral; clear smooth boundary.

IIB24t—38 to 46 inches; dark yellowish brown (10YR 4/4) silty clay; moderate coarse subangular blocky structure parting to moderate fine angular blocky; firm; few fine roots; few fine pores; nearly continuous brown clay films; common fine black concretions and stains; neutral; gradual smooth boundary.

IIB25t—46 to 56 inches; yellowish brown (10YR 5/6) silty clay; moderate coarse angular blocky structure parting to fine blocky; firm; few fine pores; many brown clay films; many black concretions, nodules, films, and stains; neutral; gradual smooth boundary.

IIB3—56 to 65 inches; mottled yellowish brown (10YR 5/6) and dark brown (10YR 3/3) clay; moderate coarse subangular blocky structure parting to moderate fine and medium angular blocky; firm; many clay films or pressure faces; many black soft nodules, films, and stains; mildly alkaline.

Solum thickness and depth to bedrock is more than 60 inches. Depth to lithologic discontinuity ranges from 24 to 48 inches. Reaction ranges from neutral to strongly acid in the upper part of the solum and from strongly acid to mildly alkaline in the lower part.

The Ap horizon has hue of 10YR or 7.5YR, value of less than 4, and chroma of 2 to 4.

The B21t horizon has hue of 10YR, 7.5YR, or 5YR; value of 4 or 5; and chroma of 4 or 6. Texture is silt loam or silty clay loam.

The B22t and B23t horizons have hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 or 6. Texture is silt loam or silty clay loam.

The IIB horizon has hue of 7.5YR, 10YR, or 2.5Y; value of 4 to 6; and chroma of 4 to 8. Some pedons are mottled in shades of gray, brown, or olive. Texture is silty clay or clay.

The IIC horizon, where present, has matrix and mottle colors in shades of brown, gray, and olive. Texture is silty clay or clay.

Woolper series

The Woolper series consists of deep, well drained, clayey soils that have moderately slow to slow permeability. These soils have a dark surface layer and formed in colluvium derived from limestone. Woolper soils are gently sloping on alluvial fans and foot slopes, where slopes range from 2 to 6 percent, and steep on side slopes, where slopes range from 30 to 50 percent.

Woolper soils are associated with Elk soils on foot slopes and alluvial fans and are below Fairmount soils on side slopes. They have a darker surface layer and more clay in the subsoil than Elk soils and are deeper to rock than the shallow Fairmount soils.

Typical pedon of Woolper silty clay loam, 2 to 6 percent slopes, 16 miles northwest of Shelbyville, 0.25 mile

southeast of bridge over Floyds Fork Creek on Kentucky Highway 408 and 100 feet west of Kentucky Highway 408 in a cultivated field:

Ap—0 to 8 inches; dark brown (10YR 3/3) silty clay loam; moderate medium granular structure; very friable; many very fine roots; common irregular and tubular pores; neutral; clear smooth boundary.

B21t—8 to 18 inches; dark brown (10YR 3/3) silty clay loam; moderate medium angular blocky and subangular blocky structure; firm; few fine roots; many fine irregular and tubular pores; many clay films; neutral; gradual smooth boundary.

B22t—18 to 39 inches; brown (7.5YR 4/4) silty clay; moderate medium prismatic structure parting to strong medium blocky; firm, sticky and plastic; few fine roots; many fine irregular pores; thick continuous dark brown (10YR 4/3) clay films; neutral; gradual wavy boundary.

B23t—39 to 50 inches; brown (10YR 4/3) silty clay; moderate medium and fine subangular blocky and angular blocky structure; firm, sticky and plastic; thin continuous clay films; neutral; clear smooth boundary.

C—50 to 72 inches; yellowish brown (10YR 5/4) silty clay; common medium distinct grayish brown (2.5Y 5/2) and few fine faint yellowish brown (10YR 5/6) mottles; massive; firm, sticky and plastic; neutral.

Solum thickness ranges from 40 to 60 inches. Depth to bedrock ranges from 60 to 80 inches or more. The content of coarse fragments ranges from 0 to 10 percent in the solum; in steep areas limestone flagstones are on the surface and within the profile. Reaction is slightly acid to mildly alkaline.

The Ap horizon has hue of 10YR or 7.5YR and value and chroma of 2 or 3. Texture is silt loam or silty clay loam.

The B21t horizon has hue of 10YR or 7.5YR and value and chroma of 2 or 3. Texture ranges from silty clay loam to clay.

The B22t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. Texture is silty clay or clay.

The B23t horizon, where present, has color similar to that of the B22t horizon. Texture is silty clay or clay.

The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 through 6. It contains common gray mottles. Texture is silty clay or clay.

Formation of the soils

In this section the factors of soil formation are described and related to the soils in the survey area. In addition, the processes of soil formation are described.

Factors of soil formation

Soil is a natural, three dimensional body on the earth's surface. It supports plants and has properties resulting from the integrated effect of climate and plant and animal life on earthy parent material, as conditioned by relief over time. In the following paragraphs the factors of soil formation are described as they relate to the soils in Shelby County.

Climate

Climate affects the physical, chemical, and biological relationship in soils. It influences the kind and number of plants and animals, the weathering and decomposition of rocks and minerals, the amount of soil erosion, and the rate of soil formation.

The climate of Shelby County is temperate and humid. The average annual precipitation is about 44 inches, and the mean annual air temperature is about 55 degrees F. The soils are seldom completely dry and are subject to leaching throughout the year. The soluble bases have been largely leached out of the surface layer and upper subsoil. Clay minerals have moved from the surface layer into the subsoil. As a result, most of the soils have a leached, acid surface layer and a subsoil that is finer textured than the surface layer. Examples are the Crider and Shelbyville soils.

Plant and animal life

Plants affect soil formation mainly by adding organic matter. Animals, bacteria, and fungi contribute to soil formation by converting plant remains to organic matter and plant nutrients. The organic matter gives a dark color to the soil material, and the humus aids in the formation of soil structure.

Most of the soils in Shelby County formed under hardwood forests. These soils are characterized by a thin, dark colored surface layer; a leached, lighter colored subsurface layer; and a brighter colored subsoil.

Man has greatly altered the surface layer and the soil environment by clearing the forests and plowing the soil. He has mixed the soil layers, moved soil from place to place, added fertilizer and lime, and introduced new plants. In places, accelerated erosion has removed most of the original surface layer and exposed the undesirable subsoil layers.

Parent material

Parent material is the unconsolidated mass from which soils form. It is produced by the weathering or decomposition of rocks and minerals. In Shelby County the soils formed in loess, stream alluvium, colluvium, and residual material. Crider, Nicholson, and Shelbyville soils formed partly in loess and partly in residuum; a thin layer of loess mantles most of the broader ridges where these soils formed. Newark and Nolin soils formed in recent alluvium on flood plains near creeks. Woolper soils formed in colluvium below steeper, shallower Fairmount soils.

Most of the surface rock formations in Shelby County consist of interbedded limestone, calcareous shale, and

siltstone of Ordovician Age. Lowell, Shelbyville, and Faywood soils formed dominantly in the residuum of limestone. Eden soils formed in materials that are dominantly shale. Crider and Beasley soils formed in rocks of the Silurian Age, which consist of dolomite and shale. These rocks occur in a small area in the western part of Shelby County.

Relief

The relief of the landscape influences soil formation primarily through its effect on drainage and erosion. Differences in landscape position also influence variations in exposure to sun and wind and in air drainage, soil temperature, and plant cover at different locations.

In areas of steep soils, a considerable amount of water is lost through runoff; therefore, only a small amount of water enters the soil. As a result, erosion removes the soil almost as rapidly as it forms. Soils on steep hillsides, such as Eden and Fairmount soils, are nearly neutral in reaction and have a thin subsoil. Most cleared areas of these soils are severely eroded. Newark and McGary soils are somewhat poorly drained and have a seasonal high water table. These soils are in low areas on flood plains or in upland depressions where water collects.

In the more gently sloping areas, enough water moves downward through the soil to cause leaching and a pronounced accumulation of clay in the subsoil. These soils are likely to be deep and have well defined layers or profiles. In places the soil shows some evidence of wetness, such as mottling in the subsoil. A fragipan that restricts water and air movement may be present.

Time

A long time is required for distinct soil profiles to develop. The length of time required in Shelby County depends mainly on the kind and nature of the parent materials and the topography. Plant and animal life and climate have comparatively less influence on the rate of soil development. With the exception of soils formed in recent alluvium, Shelby County's soils have been forming long enough that the interaction of the soil forming factors is evident.

Soils that formed in recent sediments have weak horizon development. The surface layer of these soils may show a slight increase in organic matter content, and the subsoil may have a weak structure. Soils of this type, such as Nolin and Boonesboro soils, are said to be youthful, or immature.

After a long time, if there are no further additions of sediment, weathering occurs in these soils. The weathering process causes some of the finer material in the surface layer to move into the subsoil and may cause the structure and color of the subsoil to change. Elk soils are examples of this maturing process.

A soil is generally said to be mature when it has been in place long enough to acquire distinct profile characteristics. Examples of mature soils in Shelby County are Crider and Nicholson soils.

Processes of soil formation

The formation of a succession of layers, or horizons, in soils is the result of one or more of the following processes: (1) accumulation of organic matter; (2) leaching of carbonates and more soluble minerals; (3) chemical weathering (chiefly by hydrolysis) of primary minerals into silicate clay minerals; (4) translocation of the silicate clays, and probably of some silt-sized particles, from one horizon to another; and (5) reduction and transfer of iron.

Several of these processes have been active in the formation of most soils in Shelby County. The interaction of the first four factors is reflected in the strongly expressed horizons of Crider and Shelbyville soils. All five processes have problably been active in the formation of the moderately well drained Nicholson and Otwell soils.

Some organic matter has accumulated in all the soils of Shelby County to form the surface layer, or A1 horizon. The organic matter content ranges from low in Eden soils to high in Woolper soils. If tilled, the A1 horizon will become a part of the Ap horizon.

Most of the soils in Shelby County are acid in the upper layers although they were formed in materials high in carbonates. The carbonates and more soluble materials have been partially leached into the lower layers. Beasley and Lowell soils are examples of soils in which this process occurs.

The translocation of clay minerals is an important process in the horizon development of many soils in the county. As clay minerals are removed from the A horizon, they are largely immobilized, and they accumulate as clay films on ped faces, in pores, and in root channels in the B horizon.

A fragipan has formed in the B horizon of some of the moderately well drained soils on uplands and terraces. The fragipan is a dense, compact layer that is seemingly cemented. It is hard or very hard when dry, brittle when moist, and tends to rupture suddenly, rather than deform slowly, when lateral pressure is applied. It generally is mottled, slowly or very slowly permeable to water, and has few to many bleached fracture planes that form polygons.

Gleying, which is the reduction and transfer of iron, has occurred in all soils that lack good natural drainage. Part of the iron may be reoxidized and segregated to form the yellowish brown, strong brown, and other bright colored mottles on an essentially gray matrix in the subsoil. Nodules or concretions of iron or manganese are commonly formed under conditions of poor drainage.

As silicate clay forms from primary minerals, some iron is commonly freed as hydrated oxide. These oxides are more or less red; even when present in small amounts, they give a brownish color to the soil material. They are largely responsible for the strong brown, yellowish brown, or reddish brown colors that dominate the subsoils of many soils in Shelby County.

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Glossary

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 40-inch profile or to a limiting layer is expressed as—

	Inches
Very low	less than 2.4
Low	2.4 to 3.2
Moderate	3.2 to 5.2
High	More than 5.2

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.
Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.
Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.
Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.
Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.
Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.
Soft.—When dry, breaks into powder or individual grains under very slight pressure.
Cemented.—Hard; little affected by moistening.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Depth to rock. Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:
Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.
Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.
Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.
Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.
Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.
Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.
Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 37.5 centimeters) long.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

TABLES

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Data were recorded in the period 1951-74 at Shelbyville, Kentucky]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	41.4	22.3	31.9	68	-9	9	3.30	1.70	4.60	7	4.3
February---	45.0	24.2	34.6	69	-4	18	3.12	1.41	4.51	7	3.5
March------	53.8	32.1	43.0	79	11	65	4.76	2.52	6.57	9	3.1
April------	66.5	43.0	54.8	85	24	181	4.08	2.31	5.52	8	.1
May--------	75.3	52.0	63.7	91	32	432	4.51	3.03	5.86	8	.0
June-------	82.9	60.5	71.7	95	44	651	3.71	2.23	5.02	7	.0
July-------	86.7	64.2	75.5	97	51	791	4.49	2.32	6.25	8	.0
August-----	86.0	62.7	74.4	97	49	756	3.29	1.81	4.49	6	.0
September--	80.7	56.5	68.6	95	37	558	3.28	1.63	4.62	5	.0
October----	69.8	44.3	57.1	88	25	249	2.35	1.20	3.28	4	.0
November---	55.2	34.1	44.7	79	11	16	3.53	2.02	4.75	7	1.1
December---	44.6	26.4	35.5	70	0	18	3.19	1.63	4.46	7	1.8
Yearly:											
Average--	65.7	43.5	54.6	---	---	---	---	---	---	---	---
Extreme--	---	---	---	100	-11	---	---	---	---	---	---
Total----	---	---	---	---	---	3,744	43.61	38.21	48.82	83	13.9

[1]A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Data were recorded in the period 1951-74 at Shelbyville, Kentucky]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 9	April 24	May 2
2 years in 10 later than--	April 4	April 19	April 27
5 years in 10 later than--	March 26	April 10	April 18
First freezing temperature in fall:			
1 year in 10 earlier than--	October 29	October 15	October 4
2 years in 10 earlier than--	November 2	October 20	October 9
5 years in 10 earlier than--	November 10	October 29	October 19

TABLE 3.--GROWING SEASON

[Data were recorded in the period 1951-74 at Shelbyville, Kentucky]

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	213	183	162
8 years in 10	219	189	169
5 years in 10	229	202	183
2 years in 10	239	214	197
1 year in 10	244	220	205

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
BeB	Beasley silt loam, 2 to 6 percent slopes	660	0.3
BeC	Beasley silt loam, 6 to 12 percent slopes	2,120	0.9
BeD	Beasley silt loam, 12 to 20 percent slopes	220	0.1
BfC3	Beasley silty clay loam, 6 to 12 percent slopes, severely eroded	540	0.2
Bo	Boonesboro silt loam	720	0.3
BsE	Brassfield-Beasley complex, 20 to 30 percent slopes	290	0.1
CrB	Crider silt loam, 2 to 6 percent slopes	1,190	0.5
EcC	Eden silty clay loam, 6 to 20 percent slopes	4,650	1.9
EdE3	Eden flaggy silty clay, 20 to 30 percent slopes, severely eroded	42,110	17.2
ElA	Elk silt loam, 0 to 2 percent slopes	670	0.3
ElB	Elk silt loam, 2 to 6 percent slopes	1,780	0.7
ElC	Elk silt loam, 6 to 12 percent slopes	240	0.1
FaC	Faywood silt loam, 6 to 12 percent slopes	2,400	1.0
FdD	Faywood silty clay loam, 12 to 20 percent slopes	13,660	5.6
LoB	Lowell silt loam, 2 to 6 percent slopes	13,600	5.5
LoC	Lowell silt loam, 6 to 12 percent slopes	82,320	33.6
LsC3	Lowell silty clay loam, 6 to 12 percent slopes, severely eroded	1,610	0.7
LWE	Lowell-Eden association, steep	800	0.3
Mc	McGary silt loam	270	0.1
Ne	Newark silt loam	700	0.3
NhB	Nicholson silt loam, 2 to 6 percent slopes	24,650	10.0
NhC	Nicholson silt loam, 6 to 12 percent slopes	1,080	0.4
No	Nolin silt loam	8,130	3.3
OtB	Otwell silt loam, 2 to 6 percent slopes	930	0.4
ShB	Shelbyville silt loam, 2 to 6 percent slopes	37,990	15.5
ShC	Shelbyville silt loam, 6 to 12 percent slopes	480	0.2
WoB	Woolper silty clay loam, 2 to 6 percent slopes	240	0.1
WpF	Woolper-Fairmount complex, 30 to 65 percent slopes	1,070	0.4
	Total	245,120	100.0

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn	Wheat	Soybeans	Tobacco	Grass-legume hay	Pasture
	Bu	Bu	Bu	Lb	Ton	AUM*
BeB---- Beasley	105	40	30	2,800	4.0	8.0
BeC---- Beasley	90	35	25	2,400	3.5	7.0
BeD---- Beasley	70	25	---	2,100	3.0	6.0
BfC3---- Beasley	60	---	---	---	2.5	5.0
Bo---- Boonesboro	110	40	40	2,800	3.5	7.0
BsE**---- Brassfield-Beasley	---	---	---	---	---	4.0
CrB---- Crider	135	50	45	3,400	4.5	9.0
EcC---- Eden	80	30	25	2,400	3.0	6.0
EdE3---- Eden	---	---	---	---	---	3.5
ElA---- Elk	140	50	45	3,400	4.5	9.0
ElB---- Elk	135	50	40	3,400	4.5	9.0
ElC---- Elk	110	40	35	2,800	4.0	8.0
FaC---- Faywood	80	25	25	2,500	3.5	7.0
FdD---- Faywood	---	---	---	---	3.0	6.0
LoB---- Lowell	120	40	35	3,000	4.0	8.0
LoC---- Lowell	100	35	30	2,700	3.5	7.0
LsC3---- Lowell	85	30	25	2,150	3.0	6.0
LWE**:						
Lowell----	---	---	---	---	---	5.5
Eden----	---	---	---	---	---	4.0
Mc---- McGary	110	35	40	---	3.5	7.0
Ne---- Newark	120	45	45	2,500	4.5	9.0
NhB---- Nicholson	130	40	40	3,000	4.0	8.0

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Wheat	Soybeans	Tobacco	Grass-legume hay	Pasture
	Bu	Bu	Bu	Lb	Ton	AUM*
NhC---- Nicholson	110	35	35	2,700	3.5	7.0
No---- Nolin	145	50	45	3,300	4.5	9.0
OtB---- Otwell	120	40	40	2,800	4.0	8.0
ShB---- Shelbyville	135	50	40	3,400	4.5	9.0
ShC---- Shelbyville	110	40	35	2,900	4.0	8.0
WoB---- Woolper	120	45	40	2,900	4.0	8.0
WpF**---- Woolper-Fairmount	---	---	---	---	---	---

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	8,800	---	---	---
II	82,460	81,040	700	720
III	88,910	88,640	270	---
IV	20,680	20,680	---	---
V	---	---	---	---
VI	290	290	---	---
VII	43,980	43,980	---	---
VIII	---	---	---	---

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	
BeB, BeC---------- Beasley	3c	Slight	Moderate	Slight	Moderate	Northern red oak----	63	Shortleaf pine, loblolly pine, eastern white pine, black locust, white ash, eastern redcedar.
						Eastern white pine--	69	
						Virginia pine-------	70	
						Eastern redcedar----	38	
BeD---------- Beasley	3c	Moderate	Severe	Slight	Moderate	Northern red oak----	63	Shortleaf pine, loblolly pine, eastern white pine, black locust, white ash, eastern redcedar.
						Eastern white pine--	69	
						Virginia pine-------	70	
						Eastern redcedar----	38	
BfC3---------- Beasley	4c	Moderate	Moderate	Moderate	Slight	Northern red oak----	60	Shortleaf pine, Virginia pine, eastern redcedar.
						Virginia pine-------	60	
						Eastern redcedar----	35	
Bo---------- Boonesboro	1o	Slight	Slight	Slight	Severe	Northern red oak----	85	Black walnut, eastern cottonwood, sweetgum, yellow-poplar, white ash, eastern white pine, shortleaf pine.
BsE*:								
Brassfield--------	4d	Severe	Moderate	Slight	Slight	Scarlet oak---------	45	Eastern redcedar, Virginia pine, Scotch pine.
						Eastern redcedar----	40	
Beasley----------	3c	Severe	Severe	Slight	Moderate	Northern red oak----	63	Shortleaf pine, loblolly pine, eastern white pine, black locust, white ash, eastern redcedar.
						Eastern white pine--	69	
						Virginia pine-------	70	
						Eastern redcedar----	38	
CrB---------- Crider	1o	Slight	Slight	Slight	Severe	Northern red oak----	88	Eastern white pine, yellow-poplar, black walnut, loblolly pine, white ash.
						Yellow-poplar-------	97	
						Virginia pine-------	78	
						Shortleaf pine------	80	
EcC---------- Eden	3c	Moderate	Moderate	Moderate	Slight	Eastern redcedar----	44	Eastern redcedar, Virginia pine, Scotch pine.
EdE3---------- Eden	4c	Severe	Severe	Severe	Slight	Eastern redcedar----	35	Eastern redcedar, Virginia pine, Scotch pine.
ElA, ElB, ElC------ Elk	2o	Slight	Slight	Slight	Severe	Northern red oak----	80	Eastern white pine, yellow-poplar, black walnut, loblolly pine.
						Yellow-poplar-------	90	
						Shortleaf pine------	80	
						Eastern white pine--	90	
FaC---------- Faywood	3c	Slight	Slight	Slight	Moderate	Northern red oak----	70	Shortleaf pine, loblolly pine, eastern white pine, black locust, eastern redcedar.
						Eastern white pine--	70	
						Virginia pine-------	70	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	
FdD Faywood	3c	Moderate	Moderate	Slight	Moderate	Northern red oak Eastern white pine Virginia pine	70 70 70	Shortleaf pine, loblolly pine, eastern white pine, black locust, eastern redcedar.
LoB, LoC Lowell	2c	Slight	Slight	Slight	Severe	Northern red oak Yellow-poplar Shortleaf pine Virginia pine	70 90 80 80	Yellow-poplar, eastern white pine, shortleaf pine, Virginia pine, loblolly pine.
LsC3 Lowell	3c	Slight	Moderate	Moderate	Moderate	Northern red oak Shortleaf pine Virginia pine	60 70 65	Virginia pine, shortleaf pine, loblolly pine.
LWE*: Lowell	2c	Severe	Moderate	Slight	Severe	Northern red oak Yellow-poplar Shortleaf pine Virginia pine	70 90 80 80	Yellow-poplar, eastern white pine, shortleaf pine, Virginia pine, loblolly pine.
Eden	3c	Severe	Severe	Moderate	Moderate	Eastern redcedar	44	Eastern redcedar, Virginia pine, Scotch pine.
Mc McGary	3w	Slight	Moderate	Slight	Moderate	White oak Pin oak Yellow-poplar Sweetgum	70 85 85 80	Eastern white pine, white ash, red maple yellow-poplar, American sycamore,
Ne Newark	1w	Slight	Moderate	Slight	Severe	Pin oak Eastern cottonwood Northern red oak Yellow-poplar Sweetgum	99 94 85 95 88	Eastern cottonwood, sweetgum, post oak, loblolly pine, red maple, American sycamore, eastern white pine, yellow-poplar.
NhB Nicholson	2o	Slight	Slight	Slight	Severe	Northern red oak Sweetgum Yellow-poplar	75 85 107	Black walnut, yellow-poplar, eastern white pine, shortleaf pine, white ash.
NhC Nicholson	2o	Slight	Slight	Slight	Severe	Northern red oak Sweetgum Yellow-poplar	75 85 107	Black walnut, yellow-poplar, eastern white pine, shortleaf pine, white ash.
No Nolin	1o	Slight	Slight	Slight	Severe	Sweetgum Eastern cottonwood	99 72	Sweetgum, yellow-poplar, eastern white pine, eastern cottonwood, white ash, cherrybark oak.
OtB Otwell	3o	Slight	Slight	Slight	Moderate	White oak	69	Eastern white pine, yellow-poplar white ash.
ShB, ShC Shelbyville	2o	Slight	Slight	Slight	Severe	Northern red oak	80	Eastern white pine, shortleaf pine, yellow-poplar, black walnut, white ash.
WoB Woolper	2c	Slight	Moderate	Slight	Severe	Northern red oak Yellow-poplar Shortleaf pine	80 90 80	Black walnut, yellow-poplar, eastern white pine.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	
WpF*:								
Woolper	2c	Severe	Severe	Slight	Severe	Northern red oak	80	Yellow-poplar, eastern white pine, black walnut.
						Yellow-poplar	90	
						Shortleaf pine	80	
Fairmount	4d	Severe	Severe	Severe	Slight	Northern red oak	60	Eastern redcedar, Virginia pine.
						Virginia pine	60	
						Eastern redcedar	42	

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
BeB Beasley	Moderate: percs slowly.	Slight	Moderate: percs slowly.	Slight	Moderate: too clayey.
BeC Beasley	Moderate: slope, percs slowly.	Moderate: slope.	Severe: slope.	Slight	Moderate: too clayey.
BeD Beasley	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
BfC3 Beasley	Moderate: slope, percs slowly.	Moderate: slope.	Severe: slope.	Moderate: too clayey.	Moderate: too clayey.
Bo Boonesboro	Severe: floods.	Moderate: floods.	Moderate: slope, floods.	Slight	Moderate: floods.
BsE*: Brassfield	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Beasley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
CrB Crider	Slight	Slight	Moderate: slope.	Slight	Slight.
EcC Eden	Moderate: slope, percs slowly.	Moderate: slope, too clayey.	Severe: slope.	Moderate: too clayey.	Moderate: too clayey.
EdE3 Eden	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope.
ElA Elk	Severe: floods.	Slight	Slight	Slight	Slight.
ElB Elk	Slight	Slight	Moderate: slope.	Slight	Slight.
ElC Elk	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
FaC Faywood	Moderate: percs slowly, slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope, depth to rock.
FdD Faywood	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, too clayey.	Severe: slope.
LoB Lowell	Moderate: percs slowly.	Slight	Moderate: percs slowly, slope.	Slight	Slight.
LoC Lowell	Moderate: percs slowly, slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
LsC3 Lowell	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey.	Severe: slope.	Moderate: too clayey.	Moderate: too clayey, slope.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
LWE*:					
Lowell	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Eden	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Mc McGary	Severe: percs slowly, wetness.	Moderate: wetness.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
Ne Newark	Severe: floods, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: floods.
NhB Nicholson	Moderate: percs slowly, wetness.	Moderate: wetness.	Moderate: slope, percs slowly, wetness.	Slight	Slight.
NhC Nicholson	Moderate: slope, percs slowly, wetness.	Moderate: slope, wetness.	Severe: slope.	Slight	Moderate: slope.
No Nolin	Severe: floods.	Slight	Moderate: floods.	Slight	Moderate: floods.
OtB Otwell	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight	Slight.
ShB Shelbyville	Slight	Slight	Moderate: slope.	Slight	Slight.
ShC Shelbyville	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
WoB Woolper	Moderate: percs slowly.	Moderate: too clayey.	Moderate: percs slowly, slope.	Moderate: too clayey.	Moderate: too clayey.
WpF*:					
Woolper	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Fairmount	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
BeB---- Beasley	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
BeC---- Beasley	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
BeD---- Beasley	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
BfC3---- Beasley	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Bo---- Boonesboro	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
BsE*:										
Brassfield----	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
Beasley----	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
CrB---- Crider	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
EcC---- Eden	Fair	Good	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
EdE3---- Eden	Very poor.	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
ElA, ElB---- Elk	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ElC---- Elk	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
FaC---- Faywood	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
FdD---- Faywood	Poor	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
LoB---- Lowell	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
LoC, LsC3---- Lowell	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
LWE*:										
Lowell----	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Eden----	Very poor.	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Mc---- McGary	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Ne---- Newark	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
NhB---------- Nicholson	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
NhC---------- Nicholson	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
No---------- Nolin	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
OtB---------- Otwell	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ShB---------- Shelbyville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ShC---------- Shelbyville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
WoB---------- Woolper	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WpF*:										
Woolper----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Fairmount---------	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
BeB--- Beasley	Severe: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Moderate: too clayey.
BeC--- Beasley	Severe: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: too clayey.
BeD--- Beasley	Severe: slope, too clayey.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.	Severe: slope.
BfC3--- Beasley	Severe: too clayey.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, slope.	Severe: slope.	Severe: low strength.	Moderate: too clayey.
Bo--- Boonesboro	Severe: floods, depth to rock.	Severe: floods.	Severe: floods, depth to rock.	Severe: floods.	Severe: floods.	Moderate: floods.
BsE*:						
Brassfield---	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Beasley---	Severe: slope, too clayey.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.	Severe: slope.
CrB--- Crider	Slight---	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Moderate: low strength.	Slight.
EcC--- Eden	Severe: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell, depth to bedrock.	Severe: slope.	Severe: low strength.	Moderate: too clayey.
EdE3--- Eden	Severe: slope, too clayey.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.	Severe: slope.
ElA--- Elk	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods, low strength.	Slight.
ElB--- Elk	Slight---	Slight---	Slight---	Moderate: slope.	Moderate: low strength.	Slight.
ElC--- Elk	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope.
FaC--- Faywood	Severe: depth to rock, too clayey.	Moderate: slope, depth to rock, shrink-swell.	Severe: depth to rock.	Severe: slope.	Moderate: slope, depth to rock, low strength.	Moderate: slope, depth to rock.
FdD--- Faywood	Severe: slope, depth to rock, too clayey.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope.
LoB--- Lowell	Severe: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
LoC--- Lowell	Severe: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
LsC3---------- Lowell	Severe: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: too clayey, slope.
LWE*:						
Lowell----------	Severe: slope, too clayey.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.	Severe: slope.
Eden----------	Severe: slope, too clayey.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.	Severe: slope.
Mc---------- McGary	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: wetness, shrink-swell.	Severe: shrink-swell, wetness.	Severe: shrink-swell, low strength.	Moderate: wetness.
Ne---------- Newark	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods.
NhB---------- Nicholson	Severe: wetness, too clayey.	Moderate: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Moderate: slope, wetness, shrink-swell.	Severe: low strength.	Slight.
NhC---------- Nicholson	Severe: wetness, too clayey.	Moderate: slope, wetness, shrink-swell.	Severe: wetness.	Severe: slope.	Severe: low strength.	Moderate: slope.
No---------- Nolin	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods, low strength.	Moderate: floods.
OtB---------- Otwell	Severe: wetness.	Moderate: shrink-swell.	Moderate: shrink-swell, wetness.	Moderate: slope, shrink-swell.	Severe: low strength.	Slight.
ShB---------- Shelbyville	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
ShC---------- Shelbyville	Moderate: slope.	Moderate: shrink-swell. slope.	Moderate: shrink-swell, slope.	Severe: slope.	Severe: low strength, slope.	Moderate: slope.
WoB---------- Woolper	Severe: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Moderate: too clayey.
WpF*:						
Woolper----------	Severe: slope, too clayey.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Fairmount--------	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
BeB Beasley	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
BeC Beasley	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
BeD Beasley	Severe: slope, percs slowly.	Severe: slope.	Severe: too clayey.	Severe: slope.	Poor: slope, too clayey.
BfC3 Beasley	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
Bo Boonesboro	Severe: floods, depth to rock.	Severe: floods, depth to rock, seepage.	Severe: floods, depth to rock, seepage.	Severe: floods, seepage.	Poor: thin layer.
BsE*: Brassfield	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope.
Beasley	Severe: slope, percs slowly.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: slope, too clayey.
CrB Crider	Slight	Moderate: seepage, slope.	Slight	Slight	Fair: too clayey.
EcC Eden	Severe: percs slowly, depth to rock.	Severe: slope.	Severe: too clayey, depth to rock.	Moderate: slope.	Poor: too clayey, thin layer.
EdE3 Eden	Severe: slope, percs slowly, depth to rock.	Severe: slope.	Severe: slope, too clayey, depth to rock.	Severe: slope.	Poor: slope, too clayey, thin layer.
ElA Elk	Moderate: floods.	Severe: floods.	Moderate: floods.	Moderate: floods.	Good.
ElB Elk	Slight	Moderate: slope, seepage.	Slight	Slight	Good.
ElC Elk	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.	Fair: slope.
FaC Faywood	Severe: depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, too clayey.	Moderate: slope.	Poor: thin layer.
FdD Faywood	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, too clayey.	Severe: slope.	Poor: slope, thin layer.
LoB Lowell	Severe: percs slowly.	Moderate: seepage, depth to rock, slope.	Severe: depth to rock, too clayey.	Slight	Poor: too clayey.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
LoC, LsC3 Lowell	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: slope.	Poor: too clayey.
LWE*: Lowell	Severe: slope, percs slowly.	Severe: slope.	Severe: slope, depth to rock, too clayey.	Severe: slope.	Poor: slope, too clayey.
Eden	Severe: slope, percs slowly, depth to rock.	Severe: slope.	Severe: slope, too clayey, depth to rock.	Severe: slope.	Poor: slope, too clayey, thin layer.
Mc McGary	Severe: wetness, percs slowly.	Severe: wetness.	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey, wetness.
Ne Newark	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
NhB Nicholson	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Fair: too clayey.
NhC Nicholson	Severe: percs slowly, wetness.	Severe: slope, wetness.	Severe: wetness, too clayey.	Moderate: wetness, slope.	Fair: slope, too clayey.
No Nolin	Severe: floods.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Good.
OtB Otwell	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Fair: too clayey.
ShB Shelbyville	Severe: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey.
ShC Shelbyville	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
WoB Woolper	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
WpF*: Woolper	Severe: slope, percs slowly.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: slope, too clayey.
Fairmount	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and "poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
BeB, BeC--- Beasley	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
BeD--- Beasley	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, too clayey.
BfC3--- Beasley	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Bo--- Boonesboro	Poor: thin layer.	Unsuited: excess fines.	Poor: excess fines.	Fair: area reclaim.
BsE*:				
Brassfield---	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Beasley---	Poor: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, too clayey.
CrB--- Crider	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
EcC--- Eden	Poor: thin layer, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
EdE3--- Eden	Poor: slope, thin layer, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, too clayey.
ElA, ElB--- Elk	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
ElC--- Elk	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.
FaC--- Faywood	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
FdD--- Faywood	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, thin layer.
LoB--- Lowell	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
LoC--- Lowell	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer.
LsC3--- Lowell	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, too clayey, thin layer.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
LWE*:				
Lowell	Poor: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Eden	Poor: slope, thin layer, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, too clayey.
Mc McGary	Poor: shrink-swell, low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Ne Newark	Poor: wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
NhB Nicholson	Poor: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
NhC Nicholson	Poor: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer.
No Nolin	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
OtB Otwell	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
ShB Shelbyville	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
ShC Shelbyville	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.
WoB Woolper	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey, thin layer.
WpF*:				
Woolper	Poor: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Fairmount	Poor: slope, low strength, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
BeB, BeC, BeD, BfC3--- Beasley	Slope	Hard to pack	Not needed	Erodes easily, slope.	Erodes easily, slope.
Bo--- Boonesboro	Seepage, depth to rock.	Piping, thin layer.	Not needed	Not needed	Erodes easily, depth to rock.
BsE*: Brassfield	Seepage, slope.	Piping	Not needed	Erodes easily, slope, depth to rock.	Slope, erodes easily, depth to rock.
Beasley	Slope	Hard to pack	Not needed	Erodes easily, slope.	Erodes easily, slope.
CrB--- Crider	Seepage	Hard to pack	Not needed	Favorable	Favorable.
EcC--- Eden	Depth to rock, slope.	Hard to pack, thin layer.	Not needed	Erodes easily, percs slowly, slope.	Slope, erodes easily, percs slowly.
EdE3--- Eden	Depth to rock, slope.	Hard to pack, thin layer.	Not needed	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
ElA, ElB, ElC--- Elk	Seepage	Piping	Not needed	Favorable	Slope.
FaC, FdD--- Faywood	Depth to rock, slope.	Thin layer, hard to pack.	Not needed	Depth to rock, slope.	Slope, erodes easily, rooting depth.
LoB--- Lowell	Seepage, depth to rock.	Hard to pack	Not needed	Favorable	Erodes easily.
LoC, LsC3--- Lowell	Slope, depth to rock, seepage.	Hard to pack	Not needed	Favorable	Slope, erodes easily.
LWE*: Lowell	Slope	Hard to pack	Not needed	Slope	Slope, erodes easily.
Eden	Depth to rock, slope.	Hard to pack, thin layer.	Not needed	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
Mc--- McGary	Favorable	Hard to pack, wetness.	Percs slowly	Wetness, erodes easily, percs slowly.	Percs slowly, wetness, erodes easily.
Ne--- Newark	Seepage	Wetness, piping.	Floods	Wetness, erodes easily.	Wetness, erodes easily.
NhB, NhC--- Nicholson	Favorable	Hard to pack, wetness.	Percs slowly, slope.	Rooting depth, wetness, erodes easily.	Rooting depth, erodes easily, percs slowly.
No--- Nolin	Seepage	Piping wetness.	Not needed	Erodes easily	Erodes easily.
OtB--- Otwell	Favorable	Piping, wetness.	Percs slowly	Erodes easily, rooting depth.	Erodes easily, rooting depth, percs slowly.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
ShB, ShC---------- Shelbyville	Slope, seepage.	Hard to pack-----	Not needed--------	Favorable---------	Slope.
WoB---------- Woolper	Favorable--------	Hard to pack-----	Not needed--------	Percs slowly------	Erodes easily, percs slowly.
WpF*: Woolper----------	Slope----------	Hard to pack-----	Not needed--------	Slope, percs slowly.	Erodes easily, slope, percs slowly.
Fairmount--------	Depth to rock, slope.	Thin layer, hard to pack.	Not needed--------	Depth to rock, slope.	Slope, rooting depth, erodes easily.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
BeB, BeC, BeD----- Beasley	0-5	Silt loam-------	ML, CL, CL-ML	A-4	0-5	90-100	85-100	80-100	75-100	25-35	4-10
	5-43	Silty clay, clay	CH, CL, MH	A-7	0-5	90-100	85-100	85-100	75-100	45-70	20-40
	43-50	Weathered bedrock.	---	---	---	---	---	---	---	---	---
BfC3---------- Beasley	0-5	Silty clay loam	CL	A-6, A-7	0-5	90-100	85-100	80-100	75-100	34-42	15-22
	5-47	Silty clay, clay	CH, CL, MH	A-7	0-5	90-100	85-100	85-100	75-100	45-70	20-40
	47-50	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Bo---------- Boonesboro	0-30	Silt loam-------	ML, CL, CL-ML	A-4, A-6	0-5	90-100	85-100	80-100	70-95	25-35	4-11
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
BsE*: Brassfield--------	0-8	Silt loam-------	ML, CL, CL-ML	A-4, A-6	0-10	85-95	70-90	70-90	55-85	<35	NP-15
	8-24	Silt loam, loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	5-15	80-90	70-90	65-90	50-85	<35	NP-15
	24-36	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Beasley----------	0-5	Silt loam-------	ML, CL, CL-ML	A-4	0-5	90-100	85-100	80-100	75-100	25-35	4-10
	5-43	Silty clay, clay	CH, CL, MH	A-7	0-5	90-100	85-100	85-100	75-100	45-70	20-40
	43-50	Weathered bedrock.	---	---	---	---	---	---	---	---	---
CrB---------- Crider	0-10	Silt loam-------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	85-100	25-35	4-12
	10-35	Silt loam, silty clay loam.	CL, ML, CL-ML	A-7, A-6, A-4	0	100	95-100	90-100	85-100	25-42	4-20
	35-84	Silty clay, clay, silty clay loam.	CL, CH	A-7, A-6	0-5	85-100	75-100	70-100	60-100	35-65	15-40
EcC---------- Eden	0-6	Silty clay loam	ML, CL, MH, CH	A-7, A-6	0-15	85-100	80-100	75-100	70-100	35-65	12-35
	6-26	Flaggy silty clay, flaggy clay, silty clay.	MH, CH, CL	A-7	10-45	75-100	70-100	65-100	65-95	45-75	20-45
	26	Weathered bedrock.	---	---	---	---	---	---	---	---	---
EdE3---------- Eden	0-6	Flaggy silty clay.	ML, CL, MH, CH	A-7, A-6	25-40	75-95	70-90	70-90	65-95	35-65	12-35
	6-25	Flaggy silty clay, flaggy clay, silty clay.	MH, CH, CL	A-7	10-45	75-100	70-100	65-100	65-95	45-75	20-45
	25	Weathered bedrock.	---	---	---	---	---	---	---	---	---
ElA, ElB, ElC------ Elk	0-8	Silt loam-------	ML, CL, CL-ML	A-4	0	95-100	95-100	85-100	70-95	25-35	3-10
	8-56	Silty clay loam, silt loam.	ML, CL, CL-ML	A-4, A-6	0	95-100	90-100	85-100	75-100	25-40	5-15
	56-65	Silty clay loam, silt loam.	ML, CL, CL-ML, SM-SC	A-4, A-6	0	75-100	50-100	45-100	40-95	25-40	5-15

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
FaC---------- Faywood	0-6	Silt loam-------	ML, CL, CL-ML	A-4	0-15	100	95-100	90-100	85-100	25-35	4-10
	6-30	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-15	90-100	90-100	85-100	75-100	42-70	20-45
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
FdD---------- Faywood	0-6	Silty clay loam	CL	A-6, A-7	0-15	100	95-100	90-100	85-100	34-42	15-22
	6-30	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-15	90-100	90-100	85-100	75-100	42-70	20-45
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
LoB---------- Lowell	0-8	Silt loam-------	ML, CL, CL-ML	A-4	0	100	95-100	90-100	85-100	22-32	4-10
	8-28	Silty clay, clay, silty clay loam.	CL, CH, MH	A-7, A-6	0	100	95-100	90-100	85-100	35-65	15-32
	28-50	Clay, silty clay	CH, MH, CL	A-7	0-20	95-100	90-100	85-100	75-100	45-75	20-40
	50	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
LoC---------- Lowell	0-6	Silt loam-------	ML, CL, CL-ML	A-4	0	100	95-100	90-100	85-100	22-32	4-10
	6-24	Silty clay, clay, silty clay loam.	CL, CH, MH	A-7, A-6	0	100	95-100	90-100	85-100	35-65	15-32
	24-50	Clay, silty clay	CH, MH, CL	A-7	0-20	95-100	90-100	85-100	75-100	45-75	20-40
	50	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
LsC3---------- Lowell	0-5	Silty clay loam	CL	A-6, A-7	0	100	95-100	90-100	85-100	34-42	15-22
	5-20	Silty clay, clay, silty clay loam.	CL, CH, MH	A-7, A-6	0	100	95-100	90-100	85-100	35-65	15-32
	20-44	Clay, silty clay	CH, MH, CL	A-7	0-20	95-100	90-100	85-100	75-100	45-75	20-40
	44	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
LWE*:											
Lowell----------	0-9	Cherty silt loam	ML, CL, CL-ML	A-4	15-25	85-95	80-90	75-90	70-90	22-32	4-10
	9-47	Cherty silty clay, clay, silty clay loam.	CL, CH, MH	A-7, A-6	10-25	85-95	80-95	75-90	70-90	35-65	15-32
	47-62	Clay, silty clay	CH, MH, CL	A-7	0-20	85-95	80-95	75-90	70-90	45-75	20-40
Eden----------	0-7	Silty clay loam	ML, CL, MH, CH	A-7, A-6	0-15	85-100	80-100	75-100	70-100	35-65	12-35
	7-36	Flaggy silty clay, flaggy clay, silty clay.	MH, CH, CL	A-7	10-45	75-100	70-100	65-100	65-95	45-75	20-45
	36	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Mc---------- McGary	0-16	Silt loam-------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-95	25-40	5-15
	16-69	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-100	45-60	25-35

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Ne Newark	0-9	Silt loam	ML, CL, CL-ML	A-4	0	95-100	90-100	80-100	55-95	<32	NP-10
	9-32	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	95-100	90-100	85-100	70-95	22-42	4-20
	32-70	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0-3	75-100	70-100	65-100	55-95	22-42	4-20
NhB, NhC Nicholson	0-10	Silt loam	ML, CL, CL-ML	A-4	0	95-100	95-100	85-100	80-95	25-35	5-10
	10-26	Silty clay loam, silt loam.	CL, CL-ML	A-6, A-4, A-7	0	95-100	95-100	85-100	80-100	25-45	5-20
	26-37	Silty clay loam, silt loam.	CL, CL-ML	A-6, A-4, A-7	0	95-100	90-100	80-100	75-95	25-45	5-20
	37-69	Silty clay, clay, channery clay.	CH, CL, MH	A-7	0-10	80-100	70-100	60-100	55-95	40-70	16-40
No Nolin	0-11	Silt loam	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	80-100	25-40	5-18
	11-65	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	95-100	95-100	85-100	75-100	25-46	5-23
OtB Otwell	0-8	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-95	25-35	5-15
	8-25	Silty clay loam, silt loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-95	25-40	5-20
	25-44	Silty clay loam, loam, silt loam.	CL	A-6, A-7	0	95-100	95-100	85-100	65-90	35-50	20-30
	44-61	Stratified silt loam to silty clay.	CL	A-6, A-7	0	95-100	90-100	85-100	80-95	35-50	15-25
ShB, ShC Shelbyville	0-9	Silt loam	ML, CL	A-4, A-6	0	100	95-100	90-100	85-100	25-40	3-15
	9-38	Silty clay loam, silt loam.	CL, ML	A-6, A-4, A-7	0	100	95-100	90-100	85-100	30-45	10-25
	38-65	Silty clay, clay	CH, MH, CL	A-7	0-5	95-100	90-100	85-100	75-100	45-75	25-45
WoB Woolper	0-8	Silty clay loam	CL	A-6, A-7	0-10	95-100	90-100	85-100	75-100	34-42	15-22
	8-18	Silty clay, silty clay loam, clay.	CL, CH	A-7, A-6	0-10	95-100	90-100	85-100	75-100	35-65	15-40
	18-72	Clay, silty clay	CH, CL, MH	A-7	0-10	95-100	90-100	85-100	75-100	45-75	20-45
WpF*:											
Woolper	0-5	Silty clay loam	CL	A-6, A-7	0-10	95-100	90-100	85-100	75-100	34-42	15-22
	5-12	Silty clay, silty clay loam, clay.	CL, CH	A-7, A-6	0-10	95-100	90-100	85-100	75-100	35-65	15-40
	12-60	Clay, silty clay	CH, CL, MH	A-7	0-10	95-100	90-100	85-100	75-100	45-75	20-45
Fairmount	0-14	Silty clay loam	CL	A-6, A-7	8-50	80-100	70-100	65-100	60-95	35-45	15-22
	14-18	Flaggy silty clay loam, flaggy clay, flaggy silty clay.	CH, CL	A-7, A-6	8-50	80-100	70-100	65-100	60-100	40-70	20-40
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors	
						K	T
	In	In/hr	In/in	pH			
BeB, BeC, BeD----	0-5	0.6-2.0	0.18-0.23	4.5-7.3	Low----------	0.43	3
Beasley	5-43	0.2-0.6	0.12-0.18	4.5-8.4	Moderate-------	0.28	
	43-50	---	---	---	----------	----	
BfC3----------	0-5	0.6-2.0	0.14-0.23	4.5-7.3	Low----------	0.43	3
Beasley	5-47	0.2-0.6	0.12-0.18	4.5-8.4	Moderate-------	0.28	
	47-50	---	---	---	----------	----	
Bo----------	0-30	0.6-2.0	0.18-0.23	6.1-7.8	Low----------	0.37	3
Boonesboro	30	---	---	---	----------	----	
BsE*:							
Brassfield------	0-8	0.6-2.0	0.14-0.20	6.6-7.8	Low----------	0.43	2
	8-24	0.6-2.0	0.10-0.18	7.4-8.4	Low----------	0.28	
	24-36	---	---	---	----------	----	
Beasley---------	0-5	0.6-2.0	0.18-0.23	4.5-7.3	Low----------	0.43	3
	5-43	0.2-0.6	0.12-0.18	4.5-8.4	Moderate-------	0.28	
	43-50	---	---	---	----------	----	
CrB----------	0-10	0.6-2.0	0.19-0.23	5.1-6.5	Low----------	0.32	4
Crider	10-35	0.6-2.0	0.18-0.23	5.1-6.5	Low----------	0.28	
	35-84	0.6-2.0	0.12-0.18	5.1-8.4	Moderate-------	0.28	
EcC----------	0-6	0.06-0.6	0.12-0.18	5.1-8.4	Moderate-------	0.43	3
Eden	6-26	0.06-0.2	0.08-0.13	5.1-8.4	Moderate-------	0.28	
	26	---	---	---	----------	----	
EdE3----------	0-6	0.06-0.6	0.11-0.17	5.1-8.4	Moderate-------	0.28	3
Eden	6-25	0.06-0.2	0.08-0.13	5.1-8.4	Moderate-------	0.28	
	25	---	---	---	----------	----	
ElA, ElB, ElC----	0-8	0.6-2.0	0.19-0.23	5.1-6.5	Low----------	0.32	4
Elk	8-56	0.6-2.0	0.18-0.22	5.1-6.5	Low----------	0.28	
	56-65	0.6-2.0	0.14-0.20	5.1-6.5	Low----------	0.28	
FaC----------	0-6	0.6-2.0	0.18-0.22	5.1-7.3	Low----------	0.37	3
Faywood	6-30	0.06-0.6	0.12-0.17	5.1-7.8	Moderate-------	0.28	
	30	---	---	---	----------	----	
FdD----------	0-6	0.6-2.0	0.18-0.22	5.1-7.3	Low----------	0.37	3
Faywood	6-30	0.06-0.6	0.12-0.17	5.1-7.8	Moderate-------	0.28	
	30	---	---	---	----------	----	
LoB----------	0-8	0.6-2.0	0.18-0.23	4.5-6.5	Low----------	0.37	3
Lowell	8-28	0.2-2.0	0.13-0.19	4.5-6.5	Moderate-------	0.28	
	28-50	0.2-0.6	0.12-0.17	5.1-7.8	Moderate-------	0.28	
	50	---	---	---	----------	----	
LoC----------	0-6	0.6-2.0	0.18-0.23	4.5-6.5	Low----------	0.37	3
Lowell	6-24	0.2-2.0	0.13-0.19	4.5-6.5	Moderate-------	0.28	
	24-50	0.2-0.6	0.12-0.17	5.1-7.8	Moderate-------	0.28	
	50	---	---	---	----------	----	
LsC3----------	0-5	0.6-2.0	0.18-0.23	4.5-6.5	Low----------	0.37	3
Lowell	5-20	0.2-2.0	0.13-0.19	4.5-6.5	Moderate-------	0.28	
	20-44	0.2-0.6	0.12-0.17	5.1-7.8	Moderate-------	0.28	
	44	---	---	---	----------	----	
LWE*:							
Lowell----------	0-9	0.6-2.0	0.18-0.23	4.5-6.5	Low----------	0.37	3
	9-47	0.2-2.0	0.13-0.19	4.5-6.5	Moderate-------	0.28	
	47-62	0.2-0.6	0.12-0.17	5.1-7.8	Moderate-------	0.28	

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors	
						K	T
	In	In/hr	In/in	pH			
LWE*:							
Eden	0-7	0.06-0.6	0.12-0.18	5.1-8.4	Moderate	0.43	3
	7-36	0.06-0.2	0.08-0.13	5.1-8.4	Moderate	0.28	
	36	---	---	---	---	----	
Mc	0-16	0.6-2.0	0.22-0.24	5.1-6.5	Low	0.43	3
McGary	16-69	<0.2	0.11-0.13	5.6-7.8	High	0.32	
Ne	0-9	0.6-2.0	0.15-0.23	5.6-7.8	Low	0.43	5
Newark	9-32	0.6-2.0	0.18-0.23	5.6-7.8	Low	0.43	
	32-70	0.6-2.0	0.15-0.22	5.6-7.8	Low	0.43	
NhB, NhC	0-10	0.6-2.0	0.19-0.23	4.5-6.5	Low	0.43	3
Nicholson	10-26	0.6-2.0	0.18-0.22	4.5-6.5	Low	0.43	
	26-37	0.06-0.2	0.07-0.12	4.5-6.5	Low	0.43	
	37-69	0.06-0.6	0.07-0.12	5.1-7.8	Moderate	0.37	
No	0-11	0.6-2.0	0.18-0.23	5.6-8.4	Low	0.43	5
Nolin	11-65	0.6-2.0	0.18-0.23	5.6-8.4	Low	0.43	
OtB	0-8	0.6-2.0	0.22-0.24	4.5-7.3	Low	0.43	3
Otwell	8-25	0.06-0.2	0.18-0.22	5.1-7.3	Low	0.43	
	25-44	<0.06	0.06-0.08	4.5-7.3	Moderate	0.43	
	44-61	0.06-0.2	0.19-0.21	5.1-7.3	Moderate	0.43	
ShB, ShC	0-9	0.6-2.0	0.19-0.23	5.1-7.3	Low	0.32	4
Shelbyville	9-38	0.6-2.0	0.18-0.22	5.1-7.3	Low	0.28	
	38-65	0.2-0.6	0.12-0.18	5.1-7.8	Moderate	0.28	
WoB	0-8	0.6-2.0	0.18-0.22	6.1-7.8	Low	0.37	3
Woolper	8-18	0.2-2.0	0.13-0.19	6.1-7.8	Moderate	0.28	
	18-72	0.06-0.6	0.12-0.17	6.1-7.8	Moderate	0.28	
WpF*:							
Woolper	0-5	0.6-2.0	0.18-0.22	6.1-7.8	Low	0.37	3
	5-12	0.2-2.0	0.13-0.19	6.1-7.8	Moderate	0.28	
	12-60	0.06-0.6	0.12-0.17	6.1-7.8	Moderate	0.28	
Fairmount	0-14	0.06-0.6	0.12-0.20	6.6-8.4	Moderate	0.37	2
	14-18	0.06-0.6	0.10-0.18	6.6-8.4	Moderate	0.37	
	18	---	---	---	---	----	

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--SOIL AND WATER FEATURES

[The definitions of "flooding" and "water table" in the Glossary explain terms such as "rare," "brief," "apparent," and "perched." The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
BeB, BeC, BeD, BfC3---- Beasley	C	None	---	---	>6.0	---	---	>40	Ripable	Moderate	Moderate.
Bo---- Boonesboro	B	Frequent	Brief	Jan-Apr	>6.0	---	---	20-40	Hard	Low	Low.
BsE*:											
Brassfield	B	None	---	---	>6.0	---	---	20-40	Ripable	Low	Low.
Beasley	C	None	---	---	>6.0	---	---	>40	Ripable	Moderate	Moderate.
CrB---- Crider	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
EcC, EdE3---- Eden	C	None	---	---	>6.0	---	---	20-40	Ripable	Moderate	Low.
ElA---- Elk	B	Rare	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
ElB, ElC---- Elk	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
FaC, FdD---- Faywood	C	None	---	---	>6.0	---	---	20-40	Hard	High	Moderate.
LoB, LoC, LsC3---- Lowell	C	None	---	---	>6.0	---	---	>40	Hard	High	Moderate.
LWE*:											
Lowell	C	None	---	---	>6.0	---	---	>40	Hard	High	Moderate.
Eden	C	None	---	---	>6.0	---	---	20-40	Ripable	Moderate	Low.
Mc---- McGary	C	None	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High	Low.
Ne---- Newark	C	Occasional	Brief	Jan-May	0.5-1.5	Apparent	Dec-May	>60	---	High	Low.
NhB, NhC---- Nicholson	C	None	---	---	1.5-2.5	Perched	Jan-Apr	>60	---	High	Moderate.
No---- Nolin	B	Occasional	Brief to long.	Jan-May	3.0-6.0	Apparent	Feb-Mar	>60	---	Low	Moderate.
OtB---- Otwell	C	None	---	---	1.5-2.5	Perched	Jan-Apr	>60	---	High	High.
ShB, ShC---- Shelbyville	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
WoB---- Woolper	C	None	---	---	>6.0	---	---	>60	---	Moderate	Low.
WpF*:											
Woolper	C	None	---	---	>6.0	---	---	>60	---	Moderate	Low.
Fairmount	D	None	---	---	>6.0	---	---	10-20	Hard	Moderate	Low.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--PHYSICAL ANALYSIS OF SELECTED SOILS

Soil name and report number	Horizon	Depth	Size class and particle diameter										Textural class	Coarse fragments		
			Total			Sand					Sand coarser than very fine (2-0.1)	Very fine sand plus silt (0.1-0.002)				
			Sand (2-0.05)	Silt (0.05-0.002)	Int. IV clay (<0.002)	Very coarse (2-1)	Coarse (1-0.5)	Me-dium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)				>2mm	2-19 mm	19-76 mm
		In	Percent of <2mm											Pct	Percent of <76mm	
Shelbyville silt loam: 77Ky-211-31	Ap	0-9	4.43	71.98	23.59	0.88	1.47	0.68	0.62	0.68	3.65	72.66	sil	--	--	--
	B21t	9-21	4.83	64.68	30.49	1.23	1.28	0.65	0.82	0.78	3.98	65.46	sicl	--	--	--
	B22t	21-28	5.70	59.75	34.55	1.11	1.57	0.80	1.09	0.97	4.57	60.72	sicl	--	--	--
	B23t	28-38	8.52	56.36	35.12	1.69	2.27	1.06	1.73	1.56	6.75	57.92	sicl	--	--	--
	IIB24t	38-46	13.45	46.79	39.76	3.36	2.35	1.41	3.05	2.75	10.17	49.54	sicl-sic	0.30	0.30	--
	IIB25t	46-56	14.71	39.23	46.06	2.62	2.34	1.36	4.05	4.12	10.37	43.35	c-sic	0.14	0.14	--
	IIB3	56-65	11.36	40.71	47.93	0.42	0.67	0.76	3.68	5.67	5.53	46.38	sic-c	0.24	0.24	--

TABLE 18.--CHEMICAL ANALYSIS OF SELECTED SOILS

Soil name and report number	Horizon	Depth	Reaction		Extractable bases						Extractable acidity	Sum of cations	H+Al	Base saturation		Organic matter	$CaCO_3$ equivalent	P
			1:1 soil:H_2O	1:1 soil:KCl	Ca	Mg	K	Na	TEB	CEC				TEB/CEC	TEB/SC			
			pH	pH	Millequivalent per 100 grams of soil									Pct	Pct	Pct	Pct	P/m
Shelbyville silt loam: 77Ky-211-31	Ap	0-9	6.80	5.20	12.50	1.08	0.12	0.08	13.78	15.90	7.71	21.49	0.03	86.67	64.12	3.27	0.17	39.5
	B21t	9-21	6.40	5.00	11.92	0.58	0.16	0.11	12.77	16.21	8.57	21.34	0.03	78.78	59.84	0.64	0.21	170.0
	B22t	21-28	6.50	5.00	15.25	0.75	0.19	0.14	16.33	18.14	9.14	25.47	0.03	90.02	64.11	0.34	0.20	252.5
	B23t	28-38	6.80	5.00	16.75	0.75	0.20	0.11	17.81	19.48	9.14	26.95	0.03	91.43	66.08	0.36	0.17	217.5
	IIB24t	38-46	6.70	5.20	18.50	0.83	0.23	0.08	19.64	22.70	10.28	29.92	0.03	86.52	65.64	0.34	0.19	180.0
	IIB25t	46-56	6.80	5.35	22.75	1.08	0.26	0.10	24.19	25.65	11.00	35.19	0.03	94.31	68.74	0.28	0.22	152.5
	IIB3	56-65	7.20	5.30	29.50	1.17	0.25	0.12	31.04	25.58	7.71	38.75	0.03	121.34	80.10	0.28	0.37	39.5

TABLE 19.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series]

Soil name	Family or higher taxonomic class
Beasley	Fine, mixed, mesic Typic Hapludalfs
*Boonesboro	Fine-loamy, mixed, mesic Fluventic Hapludolls
Brassfield	Fine-loamy, carbonatic, mesic Rendollic Eutrochrepts
Crider	Fine-silty, mixed, mesic Typic Paleudalfs
Eden	Fine, mixed, mesic Typic Hapludalfs
Elk	Fine-silty, mixed, mesic Ultic Hapludalfs
Fairmount	Clayey, mixed, mesic Lithic Hapludolls
Faywood	Fine, mixed, mesic Typic Hapludalfs
Lowell	Fine, mixed, mesic Typic Hapludalfs
*McGary	Fine, mixed, mesic Aeric Ochraqualfs
Newark	Fine-silty, mixed, nonacid, mesic Aeric Fluvaquents
Nicholson	Fine-silty, mixed, mesic Typic Fragiudalfs
Nolin	Fine-silty, mixed, mesic Dystric Fluventic Eutrochrepts
*Otwell	Fine-silty, mixed, mesic Typic Fragiudalfs
Shelbyville	Fine-silty, mixed, mesic Mollic Hapludalfs
Woolper	Fine, mixed, mesic Typic Argiudolls

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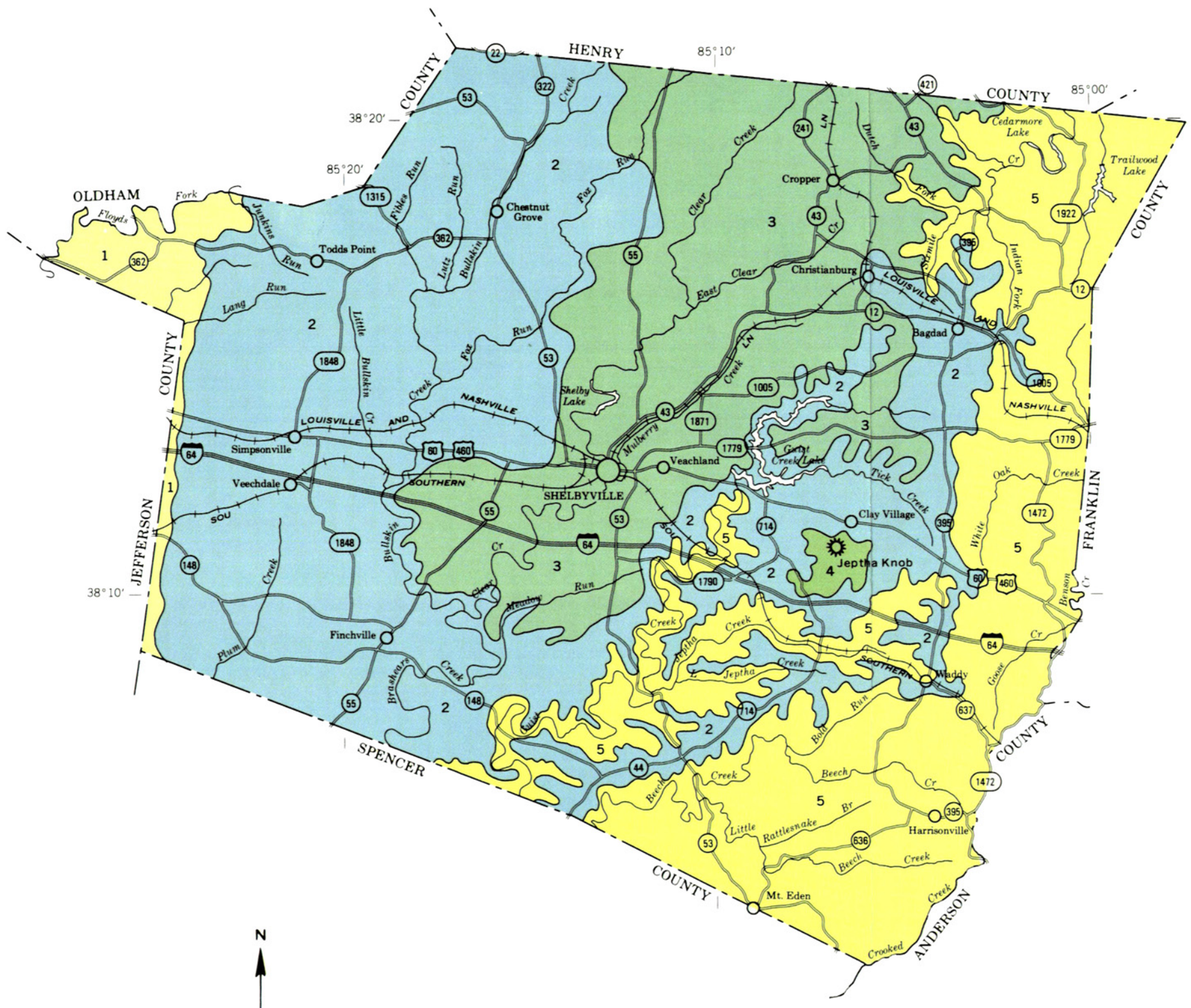


LEGEND

1 — BEASLEY-CRIDER-NICHOLSON: Deep, well drained and moderately well drained, gently sloping to moderately steep soils; on ridges and side slopes

2 — LOWELL-NICHOLSON: Deep, well drained and moderately well drained, gently sloping to sloping soils; on ridges and short side slopes

3 — SHELBYVILLE-LOWELL: Deep, well drained, gently sloping to sloping soils; on broad ridges and short side slopes

4 — LOWELL-EDEN: Deep and moderately deep, well drained, steep soils; on hillsides

5 — EDEN-LOWELL: Moderately deep and deep, well drained, sloping to steep soils; on hillsides and narrow ridges

Compiled 1979

N

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
KENTUCKY AGRICULTURAL EXPERIMENT STATION

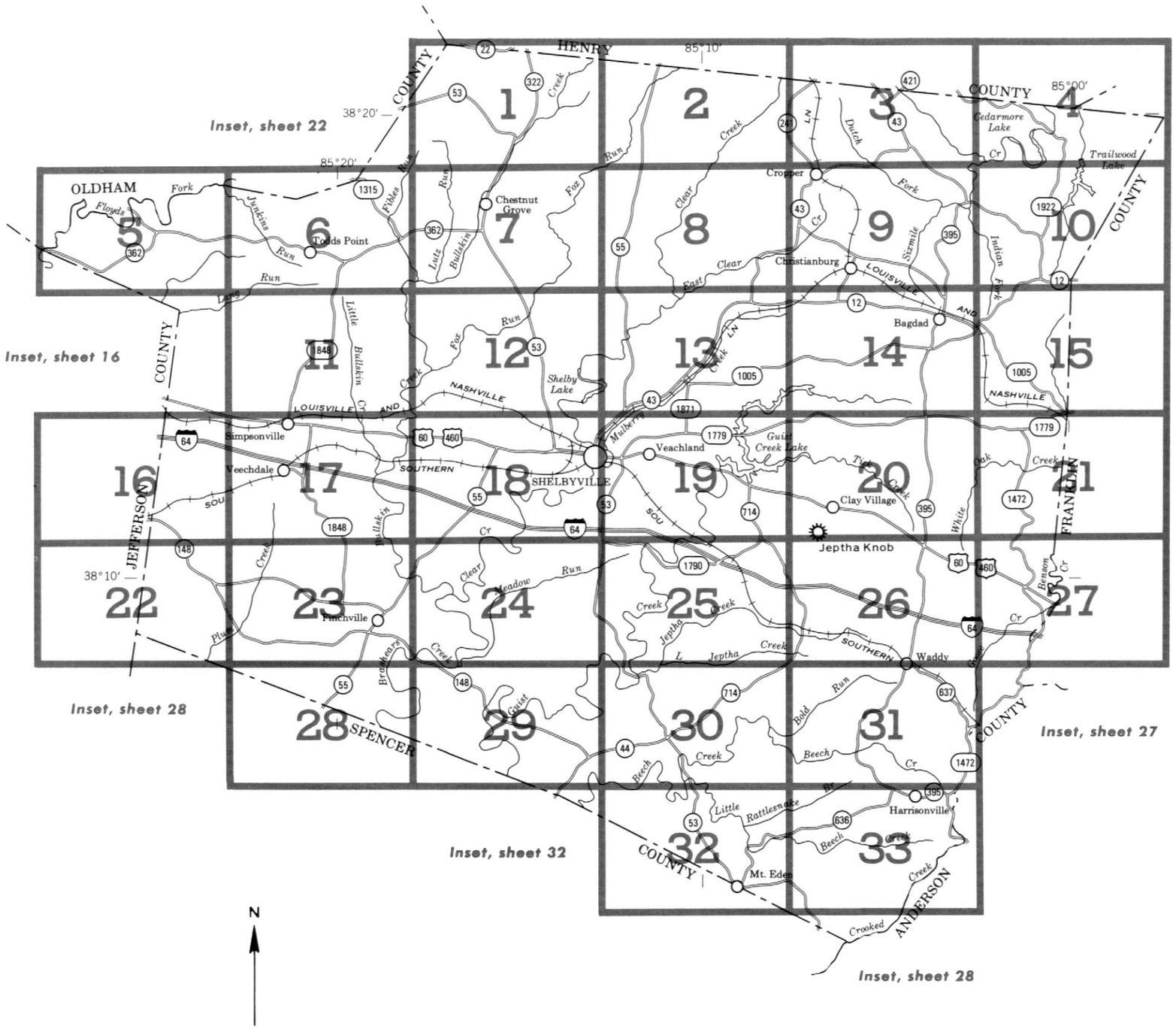
GENERAL SOIL MAP

SHELBY COUNTY, KENTUCKY

Scale 1:190,080

1 0 1 2 3 Miles

1 0 3 6 Km



Original text from each individual map sheet read:
This map is compiled on 1974 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

INDEX TO MAP SHEETS
SHELBY COUNTY, KENTUCKY

Scale 1:190,080

1 0 1 2 3 Miles

1 0 3 6 Km

SOIL LEGEND

The first letter, always a capital, is the initial letter of the soil name. The second letter is used to identify separate mapping units that begin with the same first letter. The second letter is a lower case letter for a narrowly defined unit and a capital letter for a broadly defined unit. 1/ The third letter, if used, is a capital and connotes slope class. Symbols without a slope letter are for nearly level soils. A final number of 3 in the symbol shows that the soil is severely eroded.

SYMBOL	NAME
BeB	Beasley silt loam, 2 to 6 percent slopes
BeC	Beasley silt loam, 6 to 12 percent slopes
BeD	Beasley silt loam, 12 to 20 percent slopes
BfC3	Beasley silty clay loam, 6 to 12 percent slopes, severely eroded
Bo	Boonesboro silt loam
BsE	Brassfield-Beasley complex, 20 to 30 percent slopes
CrB	Crider silt loam, 2 to 6 percent slopes
EcC	Eden silty clay loam, 6 to 20 percent slopes
EdE3	Eden flaggy silty clay, 20 to 30 percent slopes, severely eroded
ElA	Elk silt loam, 0 to 2 percent slopes
ElB	Elk silt loam, 2 to 6 percent slopes
ElC	Elk silt loam, 6 to 12 percent slopes
FaC	Faywood silt loam, 6 to 12 percent slopes
FdD	Faywood silty clay loam, 12 to 20 percent slopes
LoB	Lowell silt loam, 2 to 6 percent slopes
LoC	Lowell silt loam, 6 to 12 percent slopes
LsC3	Lowell silty clay loam 6 to 12 percent slopes, severely eroded
LWE	Lowell-Eden association, steep
Mc	McGary silt loam
Ne	Newark silt loam
NhB	Nicholson silt loam, 2 to 6 percent slopes
NhC	Nicholson silt loam, 6 to 12 percent slopes
No	Nolin silt loam
OtB	Otwell silt loam, 2 to 6 percent slopes
ShB	Shelbyville silt loam, 2 to 6 percent slopes
ShC	Shelbyville silt loam, 6 to 12 percent slopes
WoB	Woolper silty clay loam, 2 to 6 percent slopes
WpF	Woolper-Fairmount complex, 30 to 65 percent slopes

1/ Consecutive capital letters in the map symbol indicate that the composition of the unit is more variable than for others in the survey area. Mapping has been controlled well enough to be interpreted for the anticipated uses of the areas involved.

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline
- AD HOC BOUNDARY (label)
- Small airport, airfield, park, oilfield, cemetery, or flood pool (Hedley Airstrip)

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS

- Interstate (21)
- Federal (175)
- State (28)
- County, farm or ranch (1283)

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small (water, w)

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) (Indian Mound)
- Located object (label) (Tower)
- Tank (label) (Gas)
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
- Double-line (label) (CANAL)
- Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial (water, w)
- Intermittent (int, i)

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

- SOIL DELINEATIONS AND SYMBOLS (CnB, WaC2)
- ESCARPMENTS
  - Bedrock (points down slope)
  - Other than bedrock (points down slope)
- SHORT STEEP SLOPE
- GULLY
- DEPRESSION OR SINK
- SOIL SAMPLE SITE (normally not shown) (S)
- MISCELLANEOUS
  - Blowout
  - Clay spot
  - Gravelly spot
  - Gumbo, slick or scabby spot (sodic)
  - Dumps and other similar non soil areas
  - Prominent hill or peak
  - Rock outcrop (includes sandstone and shale)
  - Saline spot
  - Sandy spot
  - Severely eroded spot
  - Slide or slip (tips point upslope)
  - Stony spot, very stony spot

SHELBY COUNTY, KENTUCKY — SHEET NUMBER 1

1

N

1 700 000 FEET

310 000 FEET

OLDHAM COUNTY

HENRY COUNTY

Bullskin Creek

Bullskin Creek

Fork

(Joins inset, sheet 22)

(Joins sheet 2)

(Joins sheet 7)

1 720 000 FEET

1 Mile

5000 Feet

Scale 1:20000

SHELBY COUNTY, KENTUCKY — SHEET NUMBER 2

2

N

1 Mile
5,000 Feet
0
0
Scale · 1 : 20000
1/4
1000
1/2
2000
3/4
3000
1
4000
5000

1,745,000 FEET

310,000 FEET

HENRY COUNTY

Fox Run

Creek

(Joins sheet 1)

(Joins sheet 3)

(Joins sheet 8)

1,725,000 FEET

300,000 FEET

1 750 000 FEET

310 000 FEET

(Joins sheet 2)

(Joins sheet 4)

(Joins sheet 9)

300 000 FEET

1 770 000 FEET

3

N

1 Mile

5 000 Feet

Scale 1:20000

0 ¼ ½ ¾ 1

0 1000 2000 3000 4000 5000

SHELBY COUNTY, KENTUCKY — SHEET NUMBER 4

(4)

N

1 Mile
5000 Feet

Scale 1:20000

0 ¼ ½ ¾ 1

1 795 000 FEET

310 000 FEET

300 000 FEET

1 775 000 FEET

(Joins sheet 3)

(Joins sheet 10)

HENRY COUNTY

FRANKLIN COUNTY

SIXMILE CREEK

Cedarmore Camp

Cedarmore Lake

Beaver Dam Bend

Sweet Home Branch

Buckhorne Creek

East Fork

Scrabble Creek

Trailwood Lake

1922

NhB LoB LoC EdE3 EcC OtB FdD No

1 655 000 FEET

295 000 FEET

5

N

OLDHAM COUNTY

FLOYDS FORK

JEFFERSON COUNTY

Womens State Prison

Long Run Park

1408

362

(Joins sheet 6)

(Joins inset, sheet 16)

1 670 000 FEET

285 000 FEET

1 Mile

5000 Feet

Scale · 1:20000

6

N

1 Mile 5000 Feet

Scale 1:20000

1 695 000 FEET

(Joins inset, sheet 22)

OLDHAM COUNTY

Junkins Run

Todds Point

Lincolnfellow Hill

Tibbs Run

Bullskin Creek

Lang Run

1315

1848

962

295 000 FEET

285 000 FEET

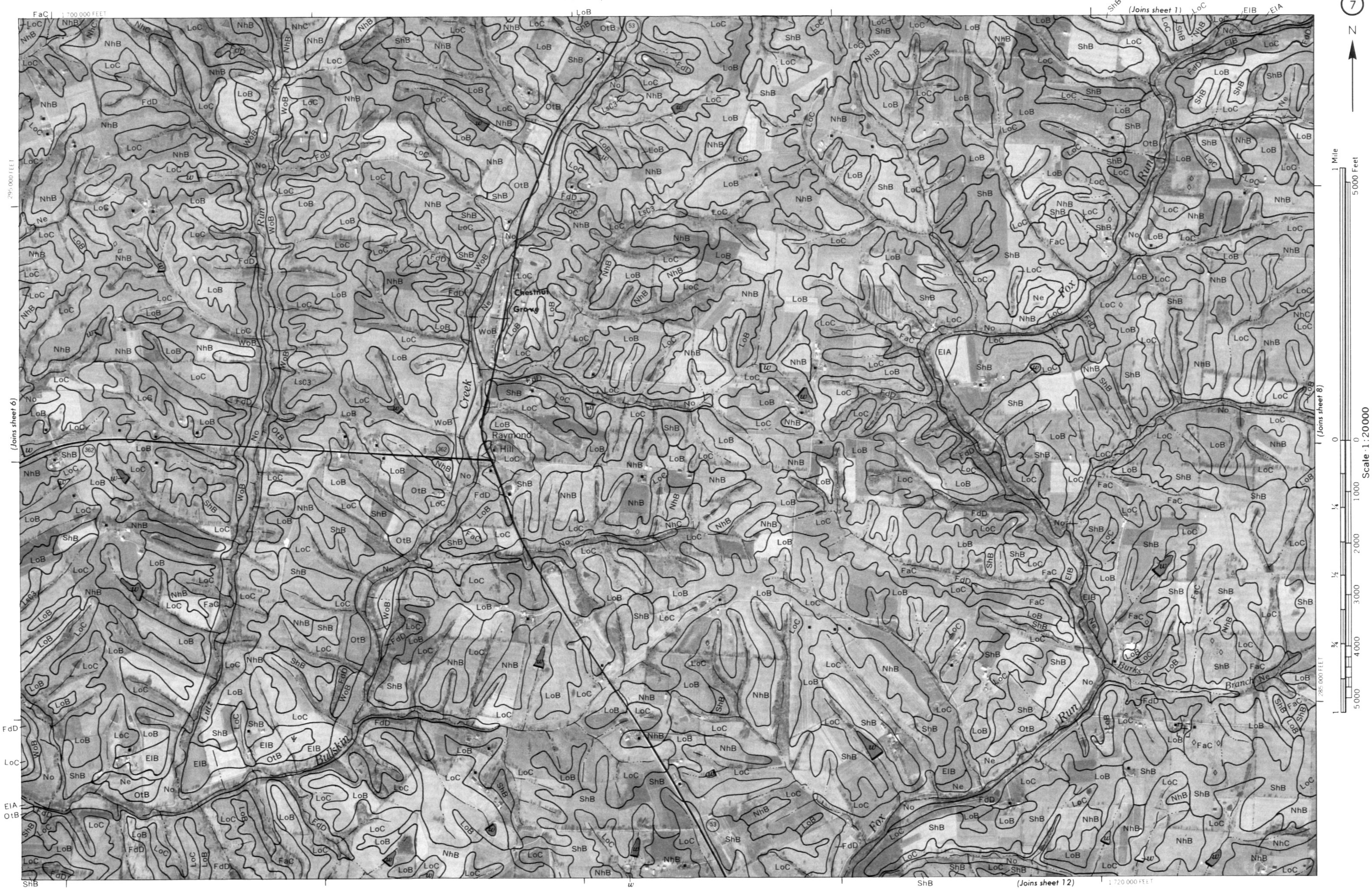
1 675 000 FEET

(Joins sheet 5)

(Joins sheet 7)

(Joins sheet 11)

SHELBY COUNTY, KENTUCKY — SHEET NUMBER 7



(Joins sheet 2)

N

1 745 000 FEET

1 Mile
5 000 Feet
Scale 1:20000
0 ¼ ½ ¾ 1
0 1000 2000 3000 4000 5000

(Joins sheet 7)

(Joins sheet 9)

1 725 000 FEET

(Joins sheet 13)

CREEK
CLEAR
Burks Branch
Clear Creek
East water

(Joins sheet 3)

(Joins sheet 8)

(Joins sheet 10)

(Joins sheet 14)

1 750 000 FEET

295 000 FEET

1 770 000 FEET

285 000 FEET

9

N

Scale 1:20000

1 Mile

5000 Feet

Cropper

Old Christianburg

Christianburg

LOUISVILLE AND NASHVILLE

Dutch Fork

Burg Creek

Sixmile Creek

Indian Fork

Clear Creek

East Bo

Bo Creek

LoB NhB LoC ShB FdD EdE3 FaC NhC OtB EcC ElB No Ne Mc

SHELBY COUNTY, KENTUCKY — SHEET NUMBER 10

10

N

(Joins sheet 4)

1 795 000 FEET

1 Mile
5000 Feet

Scale · 1 : 20000

(Joins sheet 9)

285 000 FEET

Trailwood Lake

Scrabble Cr

COUNTY

FRANKLIN

Indian Fork

Creek

Buckbone

Jacksonville

1922

1 775 000 FEET

(Joins sheet 15)

(Joins inset, sheet 16)

(Joins sheet 6)

(Joins sheet 12)

(Joins sheet 17)

1 675 000 FEET

1 680 000 FEET

1 695 000 FEET

1 670 000 FEET

11

N

Scale · 1 : 20000

1 Mile 0 5 000 Feet

1 000 0 1 000 2 000 3 000 4 000 5 000

¼ ½ ¾ 1

Simpsonville

Tater Run

Lang Run

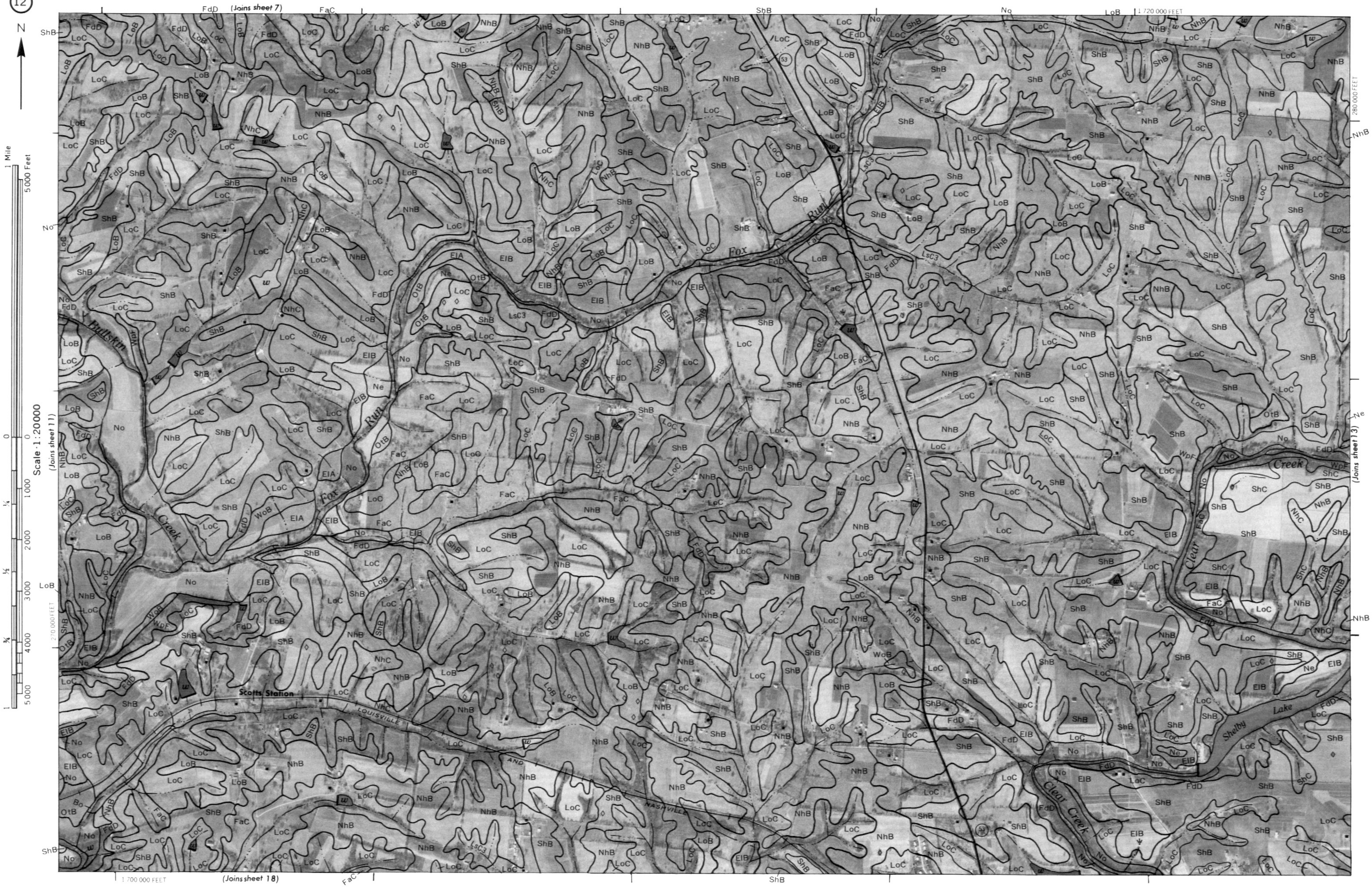
Little Bullskin Creek

Bullskin Creek

LOUISVILLE AND NASHVILLE

60 460

1848


12
N
(Joins sheet 7)
(Joins sheet 11)
(Joins sheet 13)
(Joins sheet 18)
1 720 000 FEET
280 000 FEET
270 000 FEET
1 700 000 FEET
Scale 1:20000
1 Mile
5000 Feet
Fox Run
Bullskin Creek
Clear Creek
Shelby Lake
Scotts Station
LOUISVILLE AND NASHVILLE
53

SHELBY COUNTY, KENTUCKY — SHEET NUMBER 13

13

N

1 725 000 FEET

280 000 FEET

(Joins sheet 8)

(Joins sheet 12)

(Joins sheet 14)

(Joins sheet 19)

1 745 000 FEET

Mulberry

LOUISVILLE AND NASHVILLE

Creek

CLEAR CREEK

Shelby Lake

GUIST CREEK LAKE

1 Mile 5000 Feet

Scale 1:20000

SHELBY COUNTY, KENTUCKY — SHEET NUMBER 14

14

N

(Joins sheet 9)

1 770 000 FEET

280 000 FEET

Scale · 1 : 20000

1 Mile 5 000 Feet

(Joins sheet 13)

270 000 FEET

(Joins sheet 20)

1 750 000 FEET

(Joins sheet 15)

Bagdad

Consolation

Guist Creek

Guist Creek

Middle Fork Little Eagle Creek

LOUISVILLE AND NASHVILLE

15

N

1 775 000 FEET

(Joins sheet 10)

280,000 FEET

(Joins sheet 14)

(Joins sheet 21)

1 795 000 FEET

265,000 FEET

FRANKLIN COUNTY

Indian Creek

Corinth

North Benson Creek

North Dutch Fork

LOUISVILLE AND NASHVILLE

Hatton

1005

1779

1 Mile 5,000 Feet

Scale · 1:20000

16

N

Scale 1:20000

1 Mile 5000 Feet

0 0

¼ 1000

½ 2000

¾ 3000

1 4000

5000

(Joins sheet 5)

1 670 000 FEET

280 000 FEET

270 000 FEET

1 665 000 FEET

(Joins upper right)

(Joins sheet 11)

(Joins inset)

265 000 FEET

250 000 FEET

(Joins sheet 22)

(Joins sheet 17)

JEFFERSON COUNTY

Long Run Park

Lang Run

Tater Run

Shakes Run

South Fork

LOUISVILLE & NASHVILLE

ANP

SOUTHERN

LS Park

BeB BeC BeD BfC3 ElB FaC FdD LoB LoC LsC3 NeB NhB NhC No OtB ShB

17

N

(Joins sheet 11)

(Joins sheet 16)

(Joins sheet 18)

(Joins sheet 23)

1:675,000 FEET

Simpsonville

Montclair

Lincoln Ridge

South Long Run

Plum Creek

Little Bullskin Creek

Bullskin Creek

LOUISVILLE AND NASHVILLE

SOUTHERN

water

1 Mile

5000 Feet

Scale 1:20000

18

N

Scale 1:20000

1 Mile 5,000 Feet

(Joins sheet 12)

(Joins sheet 17)

(Joins sheet 19)

(Joins sheet 24)

1 720 000 FEET

265 000 FEET

250 000 FEET

1 700 000 FEET

Middletown

Heights

Snow Hill

SHELBYVILLE

(county seat)

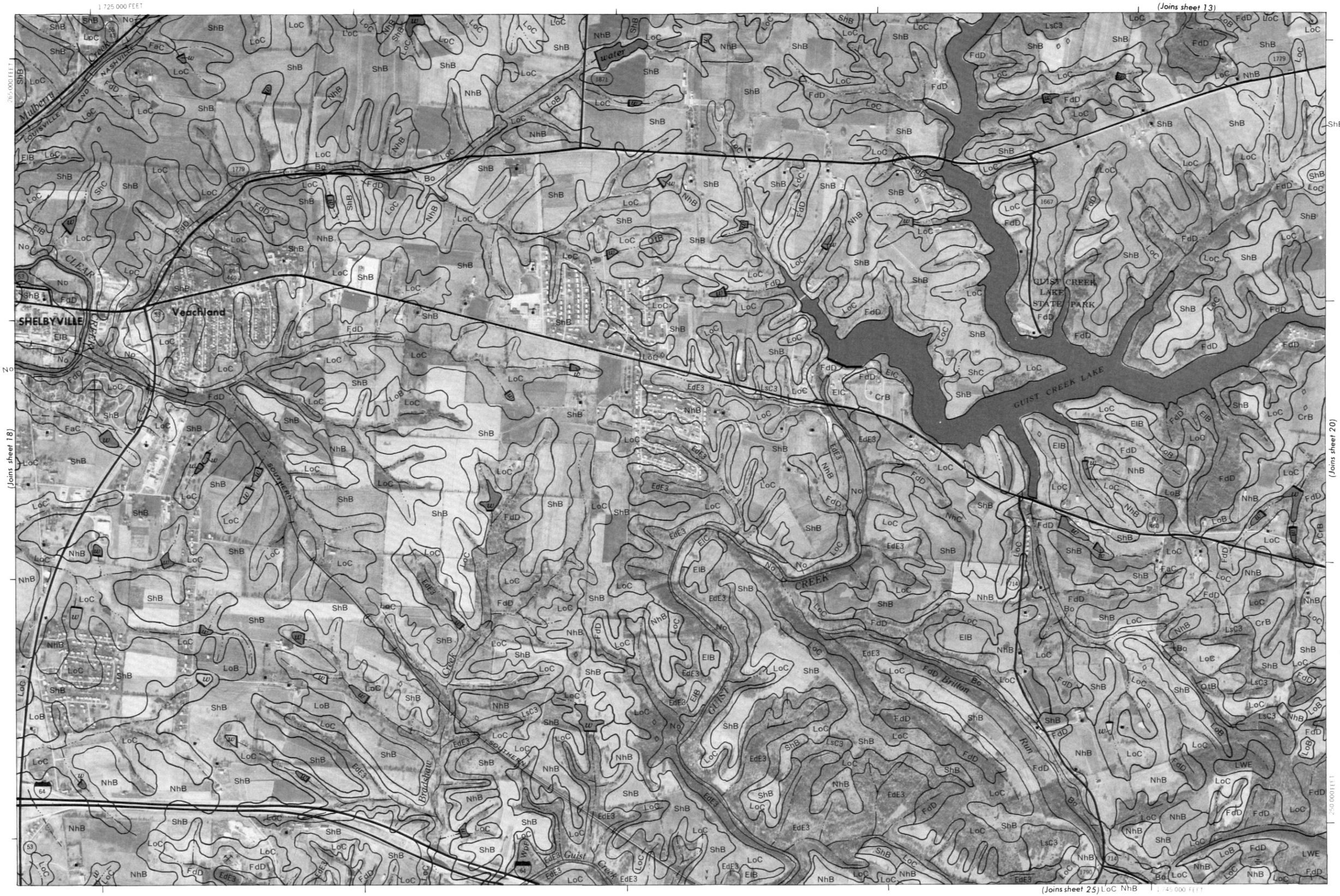
Joyes

water

CLEAR CREEK

SOUTHERN

LOUISVILLE AND NASHVILLE


1 725 000 FEET
(Joins sheet 13)
N
SHELBYVILLE
Veachland
Mulberry
CLEAR CREEK
GUIST CREEK LAKE
GUIST CREEK LAKE STATE PARK
Guist Creek
Bradshaw Run
Brilton Run
(Joins sheet 18)
(Joins sheet 20)
(Joins sheet 25)
1 Mile
5 000 Feet
Scale 1:20000

SHELBY COUNTY, KENTUCKY — SHEET NUMBER 20

20

N

Scale · 1:20000

1 Mile

5,000 Feet

(Joins sheet 14)

(Joins sheet 19)

(Joins sheet 21)

(Joins sheet 26)

1 770 000 FEET

265 000 FEET

250 000 FEET

1 750 000 FEET

Clay Village

Peytona

Jeptha Knob

Tick Creek

Oak Creek

White Oak Creek

water

1 775 000 FEET

(Joins sheet 15)

265 000 FEET

(Joins sheet 20)

(Joins sheet 27)

1 795 000 FEET

FRANKLIN COUNTY

White Oak Creek

No Name Run

Mink Run

1779

1472

LoC EcC EdE3 LoB NhB LsC3 No

21

N

1 Mile

5000 Feet

0

Scale 1:20000

1/4 1/2 3/4 1

1000 2000 3000 4000 5000

2+0 000 FEET

22

N

1 Mile 5000 Feet

Scale 1:20000

1 0 ¼ 0 ½ 1000 ¾ 2000 1 3000 1¼ 4000 5000

(Joins sheet 16)

1 670 000 FEET

1 699 000 FEET

1 694 000 FEET

(Joins sheet 6)

305 000 FEET

300 000 FEET

(Joins sheet 1)

235 000 FEET

1 650 000 FEET

245 000 FEET

(Joins sheet 23)

(Joins inset A, sheet 28)

OLDHAM COUNTY

JEFFERSON COUNTY

SPENCER COUNTY

Cane Run

Lick Fork

East Fork

PLUM CREEK

LsC3 EIB LoB LoC NhB ShB FdD BeC BeB BeD BfC3 FaC No EIC

(Joins sheet 17)

(Joins sheet 22)

(Joins sheet 24)

(Joins sheet 28)

1 675 000 FEET

1 695 000 FEET

245 000 FEET

Finchville

Bullskin

Buck Creek

Plum Creek

BRASHEARS CREEK

water

23

N

1 Mile

5 000 Feet

Scale 1 : 20 000

24

N

1 Mile

5000 Feet

Scale 1:20000

0 1000 2000 3000 4000 5000

(Joins sheet 18)

(Joins sheet 23)

(Joins sheet 25)

(Joins sheet 29)

1 720 000 FEET

1 700 000 FEET

245 000 FEET

235 000 FEET

Clear Creek

Meadow Run

BULLSKIN CREEK

BRASHEARS CREEK

Wise Run

GUIST CREEK

water

25

N

1 725 000 FEET

245 000 FEET

(Joins sheet 19)

(Joins sheet 24)

(Joins sheet 26)

(Joins sheet 30)

1 745 000 FEET

Hooper

SOUTHERN

Brittion Run

Nyakshaw Creek

GUIST CREEK

Guist Creek

Jeptha Creek

Little Jeptha Creek

Wolf Run

1 Mile

5 000 Feet

Scale 1:20000

SHELBY COUNTY, KENTUCKY — SHEET NUMBER 26

N

1 775 000 FEET

(Joins sheet 21)

245 000 FEET

(Joins sheet 26)

(Joins inset)

1 795 000 FEET

1 780 000 FEET

225 000 FEET

230 000 FEET

235 000 FEET

(Joins lower left)

(Joins sheet 31)

Graefenburg

BENSON CREEK

Water

Goose Creek

Ballard Branch

Watts Branch

No Creek

FRANKLIN COUNTY

ANDERSON COUNTY

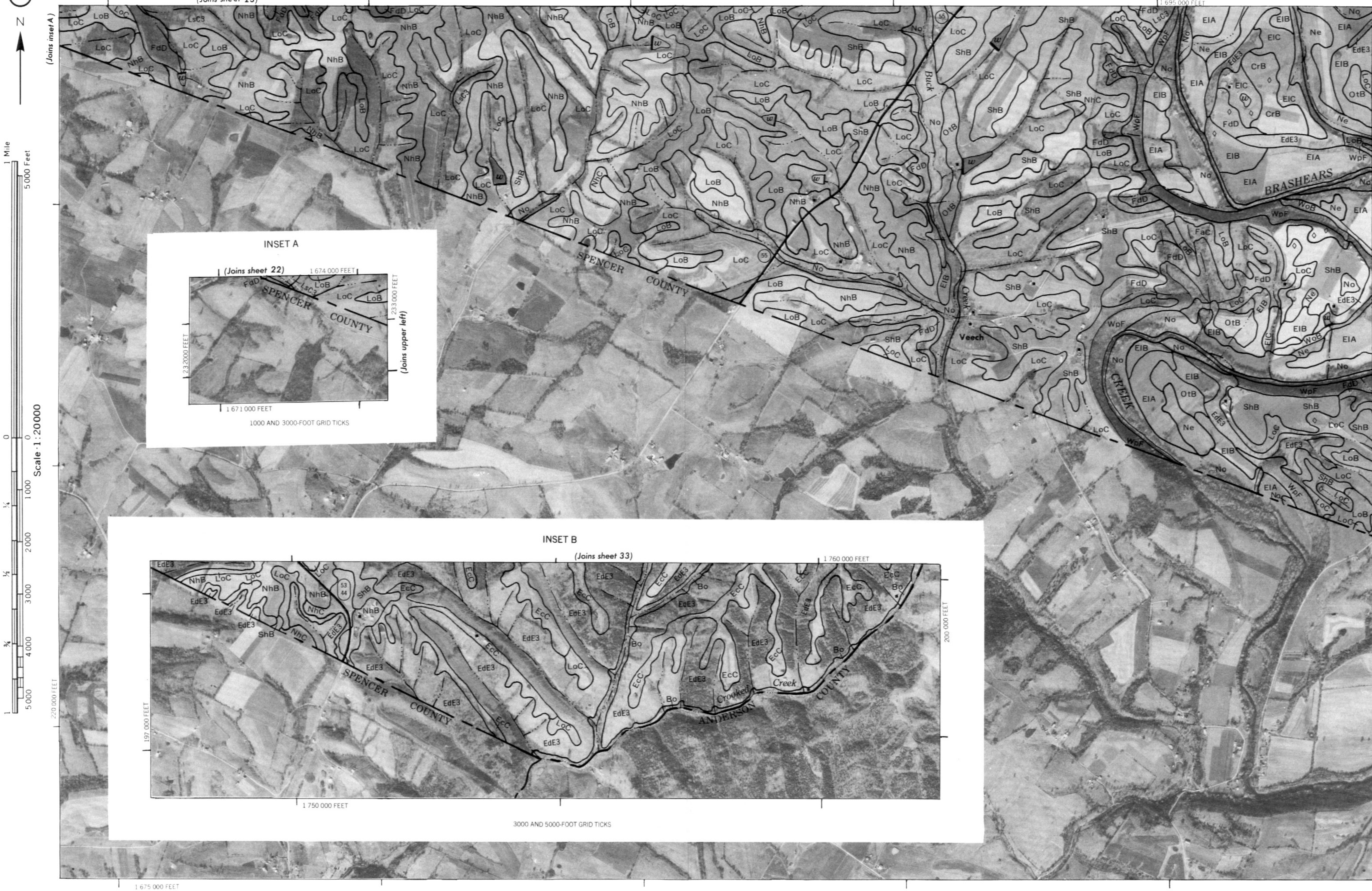
1 Mile

5000 Feet

Scale 1:20000

0 ¼ ½ ¾ 1

0 1000 2000 3000 4000 5000


(Joins sheet 23)
(Joins inset A)
(Joins sheet 29)
1 695 000 FEET
230 000 FEET
N
1 Mile
5 000 Feet
Scale 1:20000
0
1 000
2 000
3 000
4 000
5 000
220 000 FEET
1 675 000 FEET
BRASHEARS
CREEK
Buck
Creek
Veech
SPENCER
COUNTY
INSET A
(Joins sheet 22)
1 674 000 FEET
233 000 FEET
232 000 FEET
1 671 000 FEET
(Joins upper left)
1000 AND 3000-FOOT GRID TICKS
INSET B
(Joins sheet 33)
1 760 000 FEET
200 000 FEET
197 000 FEET
1 750 000 FEET
Crooked
Creek
ANDERSON
COUNTY
3000 AND 5000-FOOT GRID TICKS

(Joins sheet 24)

(Joins sheet 28)

(Joins sheet 30)

(Joins inset, sheet 32)

1 700 000 FEET

230 000 FEET

220 000 FEET

1 720 000 FEET

29

N

1 Mile

5000 Feet

Scale 1:20000

BRASHEARS CREEK

BRASHEARS Run

Wise Ne Run

Olive Branch

Figgs

GUIST CREEK

Guist Cr

SPENCER COUNTY

BEECH CREEK

SHELBY COUNTY, KENTUCKY — SHEET NUMBER 30

30

N

(Joins sheet 25)

1 745 000 FEET

1 Mile
5 000 Feet
Scale 1 : 20000
1 000 Feet

(Joins sheet 29)

220 000 FEET

Southville

GUIST CREEK

Jeptha Creek

Little Jeptha Creek

BEECH CREEK

Beech Creek

Bald Run

PEA RIDGE

(Joins sheet 31)

1 725 000 FEET

(Joins sheet 32)


1 750 000 FEET
(Joins sheet 26)
(Joins sheet 30)
(Joins inset, sheet 27)
(Joins sheet 33)
1 770 000 FEET
Waddy
SOUTHERN
Bold Run
Beech Creek
Goose Creek
PEA RIDGE
ANDERSON COUNTY
N
1 Mile
5000 Feet
Scale 1:20000

32

N

Scale · 1 : 20000

1 Mile 5000 Feet

0 ¼ ½ ¾ 1

0 1000 2000 3000 4000 5000

(Joins sheet 30)

(Joins inset)

1 745 000 FEET

215 000 FEET

205 000 FEET

213 000 FEET

1 715 000 FEET

1 720 000 FEET

216 000 FEET

1 725 000 FEET

(Joins sheet 33)

(Joins upper left)

(Joins sheet 29)

Beech Creek

Elk Creek

Little Beech Creek

Rattlesnake Branch

SPENCER COUNTY

Mount Eden

HILL

LoC NhB EdE3 ShB EcC LoB FdD No EIC LsC3 FaC WpF

SHELBY COUNTY, KENTUCKY — SHEET NUMBER 33

(Joins sheet 31)

1 750 000 FEET

215 000 FEET

(Joins sheet 32)

(Joins inset B, sheet 28)

1 770 000 FEET

2 200 000 FEET

33

N

Harrisonville

Junte

Rattlesnake Branch

Back Creek

Little Beech Creek

RIDGE

CAT

Crooked Creek

ANDERSON COUNTY

1 Mile

5000 Feet

Scale · 1:20000